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RECIP.NAME RECIPIENT AFFILIATION
ROBINSON,W.R. Carolina Power & Light Co.

98-301

SUBJECT: Informs that during 980520 telcon between R Garner & RS Baldwin,arrangements were made for admin of licensing exams at Harris Nuclear plant during week of 981005.

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May 21, 1998

Carolina Power & Light Company
ATTN: Mr. W. R. Robinson
Vice President - Harris Plant
Sharon Harris Nuclear Power Plant
P. O. Box 165, Mail Code: Zone 1
New Hill, NC 27562-0165

SUBJECT: REACTOR AND SENIOR REACTOR OPERATOR INITIAL EXAMINATIONS
HARRIS NUCLEAR PLANT - 50-400/98-301

Dear Mr. Robinson:

In a telephone conversation on May 20, 1998, between Mr. Richard Garner, Supervisor Operations Training Unit and Mr. Richard S. Baldwin, License Examiner, arrangements were made for the administration of licensing examinations at the Harris Nuclear Plant during the week of October 5, 1998.

Your staff will prepare the proposed examinations in accordance with the guidelines in Interim Revision 8, of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." The NRC regional office will discuss with your staff any examination changes that might be necessary prior to their administration. It is requested that your staff coordinate with the chief examiner to determine the appropriate quantity of operating test items necessary to maintain sequestering of candidates to a mutually acceptable level during the exam week.

To meet the above schedule, it will be necessary for your staff to furnish the proposed examination outlines by July 27, 1998. The proposed written examinations, operating tests, and the supporting reference materials identified in Attachment 2 of ES-201 will be due by August 24, 1998. Any delay in receiving the required reference and examination materials or the submittal of inadequate or incomplete materials may result in the examinations being rescheduled.

In order to conduct the requested written examinations and operating tests, it will be necessary for your staff to provide adequate space and accommodations in accordance with ES-402 and to make the simulation facility available on the dates noted above. In accordance with ES-302, your staff should retain the original simulator performance data (e.g., system pressures, temperatures, and levels) generated during the dynamic operating tests until the examination results are final.

Appendix E of NUREG-1021 contains a number of NRC policies and guidelines that will be in effect while the written examinations and operating tests are being administered.

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IE42

Your staff should submit preliminary reactor operator and senior reactor operator license applications and waiver requests at least 30 days before the first examination date so that the NRC will be able to review the applications and the medical certifications and evaluate any requested waivers. If the applications are not received at least 30 days before the examination date, a postponement may be necessary. Signed applications certifying that all training has been completed should be submitted at least 14 days before the first examination date.

This request is covered by Office of Management and Budget (OMB) Clearance Number 3150-0101, which expires April 30, 2000. The estimated average burden is 7.7 hours per response, including gathering, xeroxing and mailing the required reference material; the estimated average burden to prepare the examinations is 400 hours. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information and Records Management Branch, Mail Stop T-6 F33, Office of Information Resources Management, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555; and to the Paperwork Reduction Project (3150-0101), Office of Information and Regulatory Affairs, NEOB-10202, Office of Management and Budget, Washington, D.C. 20503.

Thank you for your cooperation in this matter. Mr. Richard Garner has been advised of the policies and guidelines referenced in this letter. If you have any questions regarding the NRC's examination procedures and guidelines, please contact Mr. Ronald F. Aiello at (404) 562-4641, or myself at (404) 562-4638.

Sincerely,

(Original signed by T. A. Peebles)

Thomas A. Peebles, Chief
Operator Licensing and Human
Performance Branch
Division of Reactor Safety

Docket Nos. 50-400
License Nos. NPF-63

cc: {See page 3}

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Docket: 05000400

February 16, 2000

Carolina Power & Light Company
ATTN: Mr. James Scarola
Vice President - Harris Plant
Shearon Harris Nuclear Power Plant
P. O. Box 165, Mail Code: Zone 1
New Hill, NC 27562-0165

SUBJECT: NRC INSPECTION REPORT NO. 50-400/2000-05

Dear Mr. Scarola:

This refers to the inspection conducted on January 31 - February 4, 2000, at your Harris facility. This was a special inspection covering activities related to the planned expansion of the Shearon Harris spent fuel pool capacity. The objectives of this inspection were to examine the equipment commissioning program for the C and D spent fuel pools, to inspect the ongoing construction activities, and to inspect the quality control processes and program for activation of the C and D spent fuel pools.

The inspection found that you have a comprehensive program to control, inspect, and document construction activities required for activation of the C and D spent fuel pools. Welding activities were being performed in accordance with Section III of the ASME Boiler and Pressure Vessel Code, and NRC requirements. The equipment commissioning program was being adequately implemented and should ensure that the C and D spent fuel pools meet design requirements and perform their design function. No violations of NRC requirements were identified during the inspection.

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

Sincerely,

ORIGINAL SIGNED BY
KERRY D. LANDIS

Kerry D. Landis, Chief
Engineering Branch
Division of Reactor Safety

Docket No. 50-400
License No. NPF-63

Enclosure: NRC Inspection Report

cc w/encl: (See page 2)

ML003685113

IE01
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# U.S. NUCLEAR REGULATORY COMMISSION

## REGION II

| | |
|---|---|
| Docket No.: | 50-400 |
| License No.: | NPF-63 |
| Report No.: | 50-400/2000-05 |
| Licensee: | Carolina Power & Light Company (CP&L) |
| Facility: | Shearon Harris Nuclear Power Plant, Unit 1 |
| Location: | 5413 Shearon Harris Road<br>New Hill, NC 27562 |
| Dates: | January 31 - February 4, 2000 |
| Inspectors: | J. Lenahan, Senior Reactor Inspector<br>Engineering Branch<br>Division of Reactor Safety<br><br>B. Crowley, Senior Reactor Inspector<br>Maintenance Branch<br>Division of Reactor Safety |
| Approved By: | Kerry D. Landis, Chief<br>Engineering Branch<br>Division of Reactor Safety |

## SUMMARY OF FINDINGS

Shearon Harris Nuclear Power Plant
NRC Inspection Report 50-400/2000-05

In a letter dated December 23, 1998, the licensee requested an amendment to the Shearon Harris facility operating licensee to place spent fuel pools (SFP) C and D in service to increase the onsite spent fuel storage capacity. The licensee is currently operating and storing fuel in SFP A and B. The design basis for pools A and B was identical to that for pools C and D. These pools are located in a single building. During the early phase of construction, in the late 1970s and early 1908's, procurement and installation of the major system components for all four spent fuel pools were performed concurrently.

During preparation of the plans for completion of the C and D SFP, the licensee discovered that documentation for piping and pipe support welds on the ASME Class III SFP piping had been inadvertently destroyed. The most significant missing documents were the weld data reports (WDRs) for each of the welds. In order to demonstrate the weld quality for the piping welds the licensee developed and implemented an alternative inspection program. The inspectors examined the alternative piping weld inspection during the inspection documented in NRC Inspection Report number 50-400/99-12. The licensee determined that the existing pipe supports which lacked complete inspection documentation would be removed and replaced with new supports during completion of the C and D SFP.

This inspection included a review of the engineering documents prepared to complete the C and D SFP; the construction and quality control (QC) program and procedures which control piping and pipe support installation necessary to complete the C and D SPF; a walkdown inspection to examine completed work; the construction records documenting installation and inspection of the new piping and pipe supports; and the licensee's program for commissioning equipment for the C and D SFP. The inspectors used Temporary Instruction (TI) 2515/143 for guidance during this inspection.

The inspectors found that the licensee has a comprehensive program to control and inspect piping installation and welding in accordance with Section III of the ASME Boiler and Pressure Vessel Code, and NRC requirements. The inspectors also found that the licensee's program for commissioning of the C and D SFP equipment was being adequately implemented and should ensure that existing equipment meets design requirements and will perform their design function. No violations of NRC requirements were identified during the inspection.

# REPORT DETAILS

## E1. Conduct of Engineering

### E1.1 Design Changes and Plant Modifications - Spent Fuel Pools C and D

a. Inspection Scope (TI 2515/143)

The inspectors reviewed the design changes prepared by licensee engineers to complete the C and D spent fuel pools.

b. Observations and Findings

The licensee implements design changes in accordance with CP&L procedure EGR-NGGC-0005, Engineering Service Requests (ESR). This procedure implements the design control program required by 10 CFR 50, Appendix B. The inspectors reviewed the following ESRs initiated by the licensee to complete the C and D spent fuel pools:

- ESR 95-00425, Study Effort to Support Fuel Pool in Service Date
- ESR 98-00218, CCW Tie In to Heat Exchangers for North Pools
- ESR99-00416, SFP Equipment Commissioning Plan

ESR 98-00218 was prepared for connecting the C and D spent fuel pool heat exchangers to the Unit 1 component cooling water system. During the inspection, the licensee was in the process of installing piping and pipe supports required for the tie-in of the CCW system to the SFP C and D heat exchangers. The final tie in will not be completed unless NRC approval is received for the fuel pool expansion. ESR 95-00425 was prepared to complete the C and D SFP piping, complete installation of equipment (pump motors, strainers, etc.), perform system pre-operational and startup testing, and revise existing plant procedures to incorporate the C and D SFP into the Unit 1 operating plant. During the current inspection pipe installation and pipe support installation was in progress. ESR 99-00416 was prepared to define the equipment commissioning requirements. Review of ESR 99-00416 and inspection of the equipment commissioning process is discussed in Section E8, below.

The inspectors reviewed the 10 CFR 50.59 safety evaluation, design inputs, design evaluations, assumptions, and references, design verification documentation, and installation drawings and instructions. The requirements and procedures for preoperational and startup testing were incomplete. Discussions with licensee engineers disclosed that these procedures will be developed following those used for startup of Unit 1 (SFP A and B). The 10 CFR 50.59 evaluation concluded that this project involved an unreviewed safety question (USQ) which required NRC approval prior to completion and startup. The USQ was due to the change in heat load on the CCW heat exchangers which had not been previously reviewed by NRC.

The above listed ESRs specify additional quality assurance (QA) requirements to supplement the current CP&L corporate program which primarily addresses the operating plant QA program. Examples of additional requirements include performance of hydrostatic testing of the systems/components in accordance with the American Society of Mechanical Engineers (ASME) Section III program which is more rigorous than the ASME Section XI program. The involvement of the Authorized Nuclear Inspector (ANI) in review of work process control sheets is also specified.

c. Conclusions

The ESRs were technically adequate and met regulatory requirements.

E1.2 Pipe Welding and Inspection Activities

a. Inspection Scope (TI 2515/143)

The inspectors reviewed procedures, observed in-process welding and weld inspection activities, examined completed welds, and reviewed records for installation of the Component Cooling Water (CCW) System and the Spent Fuel Cooling (SFC) system pipe welds.

b. Observations and Findings

Procedure Reviews

ESRs 9500425 and 98-00219 specify that welding is to be performed in accordance with the Corporate Welding Manual. In accordance with the Corporate Welding Manual, the applicable Code for this welding is the ASME Boiler and Pressure Vessel Code, Section III, 1986 Edition with no Addenda. The requirements for pipe Welding are specified by the Corporate Welding Manual NGGM-PM-0003, Revision 52. Weld nondestructive examinations (NDE) are controlled by the Nuclear NDE Manual NGGM-PM-011, Revision 7. The inspectors reviewed the following welding control and NDE procedures, which are included in these two manuals:

NW-01, Revision 7, Qualification of Welding and Brazing Procedures
NW-02, Revision 7, Qualification of Welders and Welding Operators
NW-03, Revision 6, Welding Material Control
NW-06, Revision 7, General welding Procedure for Carbon and Low Alloy Steels, Stainless Steels, and Nonferrous Alloys
NW-07, Revision 7, Weld Data Reports Preparation, and Use
NDEP-A, Revision 1, Nuclear NDE Procedures and Personnel Process
NDEP-0201, Revision 22, Liquid Penetrant Examination (visible dye, solvent removable)
NDEP-0301, Revision 13, Magnetic Particle Examination (Dry Powder, Prods and Yoke)
NDEP-0427, Revision 4, Digital Ultrasonic Thickness Measurement( Parameters Model 26DL Plus and Model 36DL Plus)
NDEP-0601, Revision 13, VT Visual Examination of Piping System and Component Welds at Nuclear Power Plants

In addition to the welding control procedures, Welding Procedure Specifications (WPSs) 08-2-01, 08-3-01, 08-8-01, 01-3-04 and 01-3-01, which were used to weld the welds inspected in the paragraphs below, were reviewed by the inspectors. The inspectors also reviewed the following documents which specified additional requirements for installation of piping:

MMP-002, Revision 8, Installation of Piping and Piping Components

Drawing number CAR 2165-G-107S01, Field Installation Tolerances for Piping

NUA-NGGC-1532, Revision 3, Certification of Quality Control Inspectors

All procedures reviewed were comprehensive and provided detailed controls for the welding and NDE processes to meet ASME Code requirements.

Observation of In-process Welding and Nondestructive Examination (NDE)

The inspectors observed/inspected welding and NDE activities for the following in-process and completed welds:

| | |
|---|---|
| Dwg. SK-9500425-M-2040 | - FW-7 -Observed welding of final pass<br>- FW-10 - Observed welding of final pass and witnessed visual (VT)and liquid penetrant (PT) inspection of the final weld<br>- FW-19 - Examined final weld after preparation for NDE<br>- FW-20 - Examined final weld after preparation for NDE<br>- FW-13 -Witnessed PT inspection of final weld<br>- FW-6 -Observed fitup, fitup inspection, and welding of the root pass |
| Dwg. Sk9800219-M-2003 | - FW-9, FW-10, FW-11, FW-57, and FW-82 - Examined final weld after acceptance by QC |
| Dwg. 2-SF-1 | -FW-3, FW-6, VW-5A, VW-5B - Examined final weld after acceptance by QC |

All work examined by the inspectors was performed by knowledgeable and qualified personnel in a quality manner. Final and in-process welds met ASME Code and licensee requirements.

The inspectors also observed the weld material issue station and examined weld material controls. The weld material issue station was orderly and weld material storage and issue were well controlled.

Review of Records

The inspectors reviewed the following records for the in-process and completed welds inspected and listed above:

In-process and completed, as applicable, Weld Data Reports (WDRs)

A sample of NDE Reports

Welder, NDE Examiner, and QC Inspector qualification records

A sample of vendor material certification records for PT materials

A sample of vendor material test reports for weld materials

All records reviewed were in order and provided good documentation to show that welding was being controlled in accordance with licensee and ASME Code requirements.

c. Conclusions

A detailed welding and NDE program equivalent to that used for original construction was in place and being implemented. Procedures were comprehensive and provided detailed controls for the welding and NDE processes. Work observed was performed by knowledgeable and qualified personnel in a quality manner. Records were in order and provided good documentation to show that welding was being controlled in accordance with licensee and ASME Code requirements.

E1.3 Installation of Pipe Supports

a. Inspection Scope (TI 2515/143)

The inspectors reviewed construction and quality control procedures which control installation of new pipe supports, examined completed pipe supports, and reviewed construction and inspection records to verify compliance with regulatory requirements.

b. Observations and Findings

The inspectors reviewed the following procedures which control installation and inspection of safety related pipe supports:

MMP-004, Revision 12, Installation of Pipe Supports

CMP-006, Revision 10, Concrete Anchors

CP&L Procedure NW-05, General Welding Procedure for Structural Welding Applications

Drawing number 2165-G-107S01, Field Installation Tolerances for Hangers

The inspectors questioned licensee engineers concerning the process controlling removal of the existing pipe supports for which documentation was missing. These discussions disclosed that the licensee initiated work requests for removal of existing supports which currently carry no vertical loads and therefore do not support the existing installed piping. For those existing supports that do carry vertical loads (supporting the existing piping), instructions for removal of the supports are specified in the WR/JO which covers installation of the new pipe support. The inspectors reviewed WR/JO numbers 99-AGLN1 and 99-ACLIN which specify the instructions for removal of supports carrying zero load on the CCW and SF piping. The work instructions specify that some support components, such as pipe clamps and struts, can be reused provided that documentation was available showing evidence that the components meet the requirements of the QA program. The remaining support materials which lack QA records documenting material specification requirements (heat numbers, physical and chemical properties, etc.) will be scrapped. Instructions were also specified in the

WR/JOs regarding repairs to embed plates in the event they were damaged by support removal.

The inspectors performed a walkdown inspection and examined the pipe supports listed below. Support number CC-H-2218 was complete. Work on the remaining supports was in progress. Acceptance criteria utilized by the inspectors included the installation drawings and the installation instructions specified in the WR/JOs. These instructions included weld data sheets, weld maps, inspection hold points, special instructions such as baseplate and concrete anchor installation requirements, if applicable, fastener torquing requirements, material verification requirements, and verification/inspection attributes. The following supports were inspected:

| Support Number | WR/JO No. | Attributes Inspected |
|---|---|---|
| CC-H-2218 | 99-ACLI6 | Support configuration and weld type and size |
| CC-H-1362 | 99-ACLI4 | Support configuration |
| CC-H-1371 | 99-ACLE3 | Support configuration and weld type and size |
| CC-H-2236 | 99-ACLE9 | Concrete anchor installation |
| CC-H-2239 | 99-ACLI7 | Concrete anchor installation |
| CC-H-2240 | 99-ACLI8 | Concrete anchor installation |
| CC-H-2241 | 99-ACLI9 | Support configuration and weld type and size. Field change request in design to resolve clearances between support and piping. |
| SF-H-1389 | 99-AGMM2 | Weld to embed plate and concrete anchor installation |

The inspectors verified that support member sizes, configuration, welding, concrete anchor installation, and other installation requirements were in accordance with the details specified in the design drawings and installation instructions. No deficiencies were identified. The inspectors reviewed the records for the above listed welds. These included WDRs and QC (visual) inspection results. The inspectors also reviewed the installation records and QC inspection records for the above listed concrete anchors. The records reviewed were complete and provided good documentation to show that the work was being performed in accordance with 10 CFR 50 Appendix B requirements.

c. Conclusions

Procedures for control of installation of pipe supports were technically adequate. Inspection of completed and in process pipe supports showed that the supports were being installed in accordance with design requirements. Records documenting installation and inspection of pipe supports were complete.

## E8 Miscellaneous Engineering Issues

E8.1 <u>(Closed) Inspector Followup Item (IFI) 50-400/99-12-01</u>, Review of Final Equipment Commissioning Details. As noted in NRC Inspection Report 50-400/99-12, a significant portion of the Fuel Pool Cooling System and Component Cooling Water System piping and components for Fuel Pools "C" and "D" were installed during original construction in the late 1970s and early 1980s. As documented in section 26.5.0 of Engineering Service Request (ESR) Design Specification 95-00425, Revision 0, the equipment was never incorporated into the operating unit and has not been formally maintained under controlled storage since that time. The equipment was procured and installed to applicable quality assurance requirements. However, since the installed equipment was stored in-place without a formal storage and lay-up program, the licensee implemented an equipment commissioning or dedication process to ensure that the equipment will meet the applicable requirements and is capable of performing its intended function in the completed design. ESR 95-00425 requires a Matrix of Commissioning Requirements is to be developed to define the commissioning requirements, including any additional inspections and testing, for each component. At the time of the 99-12 NRC inspection, a preliminary matrix had been developed as part of ESR 95-00425 and ESR 99-00416 had been initiated to further detail and manage the commissioning process. Although plans and some of the details for the process were included in ESR 95-00425, most of the details for each individual component were being developed to be included in ESR 99-00416. This IFI was issued to further review the commissioning process after issue and implementation of ESR 99-0416. At the time of the current inspection, ESR 99-00416 had been issued and was being implemented. A number of components had been through the commissioning process.

The inspectors performed the following reviews/observations to evaluate the commissioning process:

ESR99-00416, Revision 0, SFP Equipment Commissioning Plan, was reviewed. The commissioning process includes the following activities:

<u>Scope Development</u>

To develop the scope for the commissioning process, a field walkdown of the installed equipment (mechanical, civil, instrumentation and control, and electrical) was performed to compare the installed equipment with the completed modification design and each item in scope will be identified and individually dispositioned as part of ESR 99-00416. The equipment was individually entered into a matrix wherein the commissioning requirements of each item was specified.

<u>Document Review</u>

For ASME Code equipment, quality documentation will be retrieved and reviewed to ensure that required quality assurance information is available, complete and acceptable. The verified records will include original procurement and field installation records. The equipment installation records will be compared with field conditions to ensure that the installation as accepted has not been altered. If records are missing or deficient, an assessment will be performed to determine what can be accepted by virtue of retest or re-inspection, or by use of alternate methods of verification. For non-Code

items, field testing activities will be specified as necessary to ensure the items are capable of performing their intended functions.

Test and Acceptance Criteria

The equipment commissioning effort specifies additional activities needed to ensure the required level of quality assurance because of the lack of formal storage and lay-up program since original equipment installation. These activities will include:

Field verification of equipment identification against procurement documentation with establishment of traceability to ASME Code Data Reports for code related equipment.

Physical inspections and testing as required to verify that plant activities since construction and lack of controlled storage conditions and regular maintenance has not caused any condition adverse to quality.

At the time of the current inspection, the Commissioning Matrix had been issued and some commissioning work completed. The inspectors reviewed the Commissioning Matrix and selected the completed and in-process activities for review/observation. Instructions for performing the required work and inspection activities are specified in work requests which are referenced in the commissioning matrix.

The following in-process work was inspected:

WR 98-AFIY1- Disassemble and Inspect Spent Fuel Pool Cooling Pump 2A

WR 98-AFIZ1- Disassemble and Inspect Spent Fuel Pool Cooling Pump 2B

Disassembly of Pump 2A was observed. Pump 2B, which had been disassembled prior to the inspection and not yet re-assembled was also observed. Other than a small amount of sand type material inside the pump casings, the internals of both pumps were in good condition. The licensee planned to replace the bearings and seals on both pumps.

WR 98-AFJF1- Disassemble and Inspect Train A Spent Fuel Cooling System Strainer

The internals of the "A" train strainer were observed. The strainer appeared to be in good condition.

WR 00-AAKR1 - Inspection of Shell Side of Train A Spent Fuel Cooling Heat Exchanger

WR 00-AAKS1 - Inspection of Shell Side of Train B Spent Fuel Cooling Heat Exchanger

These WRs were issued to inspect the shell side of the heat exchangers. The inspections included ultrasonic (UT) thickness inspection of the heat exchanger wall and boroscopic inspection of the internal (shell side) of the heat exchangers. The inspectors observed both of these inspections.

For the wall thickness inspections, the inspectors witnessed the UT measurements, observed calibration of the UT equipment (prior to and after the

inspections), and verified qualification of the NDE examiner. The wall thickness inspection consisted of approximately 50 inspections in a grid pattern on the bottom of each heat exchanger shell. If any type of degradation or corrosion of the shell occurred, the bottom was considered to be most susceptible. The UT measurements showed the shells to be uniform in thickness with no indication of wall thinning.

For the boroscopic inspection, in addition to witnessing licensee personnel, the inspectors observed the internal condition of the shell side of the heat exchangers using the boroscope. The inspection was performed through drain nozzles (2 in each heat exchanger) in the distributor boxes at the end of each tube bundle. The inspection was very limited due to the small nozzles and the lack of access to the tube bundles once inside the distributor boxes. Although detailed inspections were not possible, the general condition appeared to be good with light surface rust on the shell. Based on the limited view of the tube bundle, the tubes appeared shiny and clean.

The heat exchangers will be subject to additional testing during startup and preoperational tests. These tests include cleaning and flushing, hydrostatic testing of both the shell side and tube side of the heat exchangers to 150 percent of design/operating pressure, and testing to verify the operational characteristics of the heat exchangers.

WR 98-AFJB1 - Disassembly and Inspection of Spent Fuel Cooling System Heat Exchanger Outlet Isolation Valve 2SF-16

The valve had been removed from the system for inspection and re-furbishment as required. The inspectors observed the internal condition of the valve, and with exception of light surface rust, the valve appeared to be in good condition.

The following completed work packages were reviewed:

WR 98-AFIW1 - Spent Fuel Cooling System Valve 2SF-20, Remove, Disassemble, Inspect, and Re-furbish Valve

WR 98-AFIX1 - Spent Fuel Cooling System Valve 2SF-10, Remove, Disassemble, Inspect, and Re-furbish Valve

WR 98-AFIU1 - Spent Fuel Cooling System Valve 2SF-19, Remove, Disassemble, Inspect, and Re-furbish Valve

WR 98-AFIT1 - Spent Fuel Cooling System Valve 2SF-11, Remove, Disassemble, Inspect, and Re-furbish Valve

These manual valves had been removed from the system, disassembled, inspected, and re-assembled with new packing and gaskets. The completed work packages documented completion of the commissioning work in accordance with approved procedures and appropriate craft and QC signoffs.

Based on the above reviews/observations, the inspectors concluded that the equipment commissioning process should ensure that existing equipment will meet requirements and will perform its design function. The observed activities and the completed records reviewed were considered appropriate to ensure that equipment is acceptable and provided evidence that the commissioning process was being adequately implemented as detailed in the licensee's commissioning process. This IFI is closed.

## MANAGEMENT MEETINGS

The Inspectors presented the inspection results to members of licensee management and staff at the conclusion of the inspection on February 4, 2000. The licensee acknowledged the findings presented. Dissenting comments were not received from the licensee. The licensee did not identify any materials used during the inspection as proprietary information.

## PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Alexander, Manager, Regulatory Affairs
B. Altman, Manager, Major Projects Section
C. Burton, Director of Site Operations
J. Eads, Supervisor, Licensing and Regulatory Programs
S. Edwards, SFP Activation Project Manager
J. Lane, Mechanical Engineer, Major Projects Section
J. Scarola, Vice President, Harris Plant
K. Shaw, Licensing Engineer, Major Projects Section
M. Wallace, Senior Analyst, Licensing

Other licensee employees contacted included engineering, maintenance and administrative personnel.

NRC:

J. Brady, Senior Resident Inspector

## INSPECTION PROCEDURE USED

TI 2515/143, Shearon Harris Spent Fuel Pool ("C" and "D") Expansion

## LIST OF ITEMS OPENED, CLOSED, OR DISCUSSED

Opened

NONE

Closed

50-400/99-12-01 IFI Review of Final Equipment Commissioning Details

Discussed

None

50-400
2/3/2000
99-13



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FEBRUARY 3, 2000

SDP/EA 2000-22

Carolina Power & Light Company
ATTN: Mr. James Scarola
Vice President - Harris Plant
Shearon Harris Nuclear Power Plant
P. O. Box 165, Mail Code: Zone 1
New Hill, NC 27562-0165

SUBJECT: FIRE PROTECTION INSPECTION (NRC INSPECTION REPORT NO. 50-400/99-13)

Dear Mr. Scarola:

This refers to the inspection conducted onsite on November 1 - 5, 1999, at your Shearon Harris facility. Subsequent to the onsite inspection, your staff provided additional information to the inspectors for review. Our in office inspection of this additional information was completed on December 20, 1999. This was a Fire Protection Inspection which was performed in accordance with Inspection Procedure 71111.05 under the pilot plant study for the new inspection oversight process. The enclosed report presents the results of this inspection.

The inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas the inspection consisted of a selective examination of procedures and representative records, observations of activities, and interviews with personnel. The primary objective of this inspection was to assess the adequacy of the Harris fire protection program implementation with emphasis on verification that the post-fire safe shutdown capability and the fire protection features provided for maintaining one train of this capability free of fire damage. The results of this inspection (including the inspectors' review of the additional information provided) were discussed on December 20, 1999, with Mr. C. Burton and other members of your staff.

The inspectors identified three unresolved items: (1) the Thermo-Lag fire barrier between the B Train Switchgear Room/Auxiliary Control Panel (ACP) Room and the A Train Cable Spreading Room (CSR) has a tested fire rating of one hour and 48 minutes instead of the three-hour rating referenced in the Harris Plant Final Safety Analysis Report and the NRC Safety Evaluation Report; (2) the 10 CFR 50.59 evaluation performed by the licensee to justify the 40 percent reduction in margin of the Thermo-Lag fire barrier assembly rating requires further NRC review to determine the adequacy of the 10 CFR 50.59 evaluation and the acceptability of this reduction in the fire barrier assembly rating; and (3) the licensee's fire testing and acceptance criteria used to determine the fire resistive performance of the Hemyc/MT cable wrap fire barrier systems installed to separate safe shutdown functions within the same fire area requires further NRC



IE01

review to determine its acceptability. Region II requested the Office of Nuclear Reactor Regulation's (NRR) assistance in Task Interface Agreement (TIA) 99-028, dated November 23, 1999, in evaluating the resolution to these items. We will inform you of the results of our evaluation.

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,

*Original Signed by Kerry D. Landis*

Kerry D. Landis, Chief
Engineering Branch
Division of Reactor Safety

Docket Nos. 50-400
License Nos. NPF-63

Enclosure: NRC Inspection Report

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REGION II

| | |
|---|---|
| Docket Nos.: | 50-400 |
| License Nos.: | NPF-63 |
| Report Nos.: | 50-400/99-13 |
| Licensee: | Carolina Power & Light Company (CP&L) |
| Facility: | Shearon Harris Nuclear Power Plant, Unit 1 |
| Location: | 5413 Shearon Harris Road<br>New Hill, NC 27562 |
| Dates: | November 1 - 5, 1999, onsite, Shearon Harris<br>November 8 - December 20, 1999, in office, Region II |
| Inspectors: | G. Hausman, Senior Reactor Inspector, Region III<br>M. Thomas, Senior Reactor Inspector, Region II<br>G. Wiseman, Senior Reactor Inspector (Lead Inspector), Region II |
| Observer: | P. Qualls, Fire Protection Engineer, Office of Nuclear Reactor Regulation |
| Approved By: | Kerry D. Landis, Chief<br>Engineering Branch<br>Division of Reactor Safety |

ENCLOSURE

## SUMMARY OF FINDINGS

Shearon Harris Nuclear Power Plant, Unit 1
NRC Inspection Report 50-400/99-13

The report covers a one-week period of inspection onsite and additional review in the Region II Office. This inspection included a review and evaluation of the Shearon Harris fire protection program implementation, with emphasis on verification that the post-fire safe shutdown capability and the fire protection features provided for maintaining one train of this capability free of fire damage, have been correctly maintained within the licensing and design bases for Fire Areas 12-A-CR/CRC1, 1-A-SWGR-A, 1-A-SWGR-B, and 1-A-BAL-B. No findings were identified during this inspection.

The inspection identified the following unresolved items:

- Fire endurance testing demonstrated that the Thermo-Lag walls which serve as part of the fire area separation barriers between cable spreading rooms A and B and switchgear room B would provide a 1 hour and 48 minutes barrier for a 3-hour fire loading area with no automatic suppression and a fire brigade that had not practiced in the area for over seven years. The licensee performed an evaluation to justify the acceptability of the Thermo-Lag wall in lieu of the fire endurance test results. An unresolved item was identified for this issue pending further NRC review to determine the adequacy of the protection provided by the Thermo-Lag fire barrier assemblies within the Cable Spreading and Auxiliary Control Panel Rooms. (Section 1R05.2.2)

- Changes were made to the Updated Final Safety Analysis Report (UFSAR) under 10 CFR 50.59 to revise the fire rating of the Thermo-Lag fire barriers in the switchgear room, ACP room, and cable spreading rooms from 3-hour barriers as approved in the Safety Evaluation Report (SER), without prior Commission approval, that involved a change to the approved fire protection program. The change to the Thermo-Lag barrier fire rating represented a 40% degradation (derating) of the margin of fire resistance from that established in the approved fire protection program. This issue is identified as an unresolved item pending NRR's review and determination of the adequacy of the 10 CFR 50.59 evaluation to support the FSAR change of the fire barrier rating from 3-hours to that which is adequate for the hazard. (Section 1R05.2.3)

- The appropriate test methodology and acceptance criteria may not have been used to determine the fire resistive performance of the Hemyc/MT cable wrap fire barrier systems installed to separate safe shutdown functions within the same fire area. This issue was identified as an unresolved item pending NRR's review to determine whether the licensee's use of the Hemyc and Promatec "MT" fire barrier wrap systems as qualified one-hour and three-hour fire barriers is acceptable. (Section 1R05.2.4)

# REPORT DETAILS

## REACTOR SAFETY

## CORNERSTONES: INITIATING EVENTS and MITIGATING SYSTEMS

## 1R05 FIRE PROTECTION

### INTRODUCTION

The objective of this Fire Protection Inspection was to perform a review of the licensee's fire protection program for selected risk significant plant fire areas with emphasis on post-fire safe shutdown capability and the fire protection features provided for ensuring that at least one post-fire safe shutdown success path is maintained free of fire damage.

### 1. Systems Required to Achieve and Maintain Post-Fire Safe Shutdown

#### a. Inspection Scope

The inspectors reviewed the licensee's shutdown methodology documented in Calculations E-5524 and E-5525; and abnormal operating procedures (AOP) AOP-004 and AOP-036. These documents were reviewed to verify that the methodology had properly identified the components and systems necessary to achieve and maintain safe shutdown for the selected fire areas. This included verifying that: (1) the reactivity control function was capable of achieving and maintaining cold shutdown conditions; (2) the reactor coolant makeup function was capable of maintaining the reactor coolant level within the level indication in the pressurizer; (3) the reactor heat removal function was capable of achieving and maintaining decay heat removal; (4) the process monitoring equipment provided direct readings of the process variables for reactivity control, coolant makeup, and decay heat removal functions; and (5) the support system functions were capable of providing the services necessary to permit extended operation of the equipment used to accomplish safe shutdown functions. The risk significant fire areas selected for review included the following:

| | |
|---|---|
| 12-A-CR/CRC1 | Main Control Room/Control Room Complex |
| 1-A-SWGR-A | Switchgear Room A |
| 1-A-SWGR-B | Switchgear Room B |
| 1-A-BAL-B/Room 1-A-4-CHLR | Reactor Auxiliary Building Unit 1 Balance |

#### b. Observations and Findings

There were no findings identified and documented during this inspection.

## 2. Fire Protection of Safe Shutdown Capability

### 2.1 Fire Barrier Enclosures - Thermo-Lag Walls

a. Inspection Scope

The inspectors reviewed the actions that Carolina Power & Light Company (CP&L) had taken to resolve the technical issues related to the fire-resistive performance of Thermo-Lag fire area enclosures (i.e., fire area walls). The team also reviewed installed fire area barrier enclosures, the plant licensing basis, supporting fire tests, and evaluations.

In 1991, the NRC found that Thermo-Lag fire barrier material did not perform to the manufacturer's specifications. NRC Bulletin 92-01, "Failure of Thermo-Lag 330 Fire Barrier Systems to Maintain Cabling in Wide Cable Trays and Small Conduits Free From Fire Damage," identified that testing demonstrated that the fire resistant capability of the material had been declared indeterminate and required licensees with Thermo-Lag barriers to consider these fire barriers to be degraded.

b. Observations and Findings

The Shearon Harris Facility has Thermo-Lag fire barrier enclosure installations as complete wall and floor sections that constitute a portion of fire area boundaries between cable spreading rooms (CSR) A and B and switchgear room "B" (fire areas 1-A--CSRA, 1-A-CSRB, and 1-A-SWGR-B). The Auxiliary Control Panel (ACP) room [fire zone 1-A-ACP] is contained within fire area 1-A-SWGR-B. As originally designed and installed, these Thermo-Lag fire barrier enclosures were intended to provide three hours of fire endurance capability, based on standard fire test exposures.

Automatic fire detection and suppression systems are provided in fire areas 1-A-CSRA and 1-A-CSRB. No automatic suppression coverage is provided within the Thermo-Lag fire barrier enclosures or fire area 1-A-SWGR-B including the ACP room. An automatic fire detection system is provided within the Thermo-Lag fire barrier enclosures in fire areas 1-A--CSRA and 1-A-CSRB. No fire detection capability was originally provided with the Thermo-Lag fire barrier enclosure located in the ACP room, however, ESR 97-00562 was issued to add an ionization type fire detector inside this enclosure.

The Thermo-Lag fire barrier enclosures in the cable spreading and ACP rooms are comprised of two general configurations. One configuration consists of a vertical wall extending full height from floor to ceiling in the ACP room and in CSRA. The other configuration consists of two-sided enclosures (one Thermo-Lag wall and one floor assembly) located in the overhead areas of the respective cable spreading and ACP rooms. The concrete walls and ceilings in the rooms form the remaining sides of these enclosures.

The licensee performed full-scale fire endurance tests to evaluate the performance capability of the installed Thermo-Lag enclosure configurations. The fire tests were performed on similar floor and wall designs. The tests involved a one hour test of a vertical wall element and three hour test of wall and floor elements. A one-hour test was performed on September 14, 1994 (Omega Point Project No. 14980-97261). The test was run for a one-hour rating period using American Society for Testing and Materials (ASTM) E-119 as the testing method and acceptance criteria. The assembly met the temperature rise limits as measured on the cold side of the wall. A solid-bore hose stream test was conducted upon completion of the fire test. At 60 seconds into the hose stream test, water leakage was discovered at the interface of panel to panel joints. The hose stream test was stopped. Note that ASTM E-119 requires the hose stream test to last a minimum of one minute (60 seconds) per each 100-square feet of test assembly area (i.e., 60 seconds for this test assembly to be considered a one-hour rated assembly). After the assembly sat for approximately 1½ hours, the testing laboratory conducted an after-the-fact additional 90 second hose stream test. The assembly remained unchanged with the additional leakage around a thermocouple. Due to these discrepancies the required hose stream test for a 1-hour rated assembly is considered to be indeterminate. Also note that ASTM E-119 requires a minimum 2-1/2 minutes (150-second hose stream test per each 100-sq. feet of assembly area) to qualify a three-hour fire barrier assembly.

Another full-scale test was performed on May 23, 1995 (Omega Point Project No. 14980-98207). The test articles included horizontal floor portions of two-sided enclosures and a vertical wall element that contained an upgrade to the penetration seal sleeves. This test was scheduled to run for a 3-hour rating period with no hose stream test at the end. The licensee had planned on using the hose stream test results from the test of September 4, 1994, as allowed, with restrictions by ASTM E-119. (See previous discussion involving the acceptability of the hose stream testing.) This Thermo-Lag fire testing demonstrated that the fire barrier walls that constitute a portion of fire area boundaries between the cable spreading rooms A and B and switchgear room "B", fire areas 1-A--CSRA, 1-A-CSRB, and 1-A-SWGR-B would provide a fire-resistive rating for 1-hour and 48 minutes. The horizontal Thermo-Lag floor fire barrier test assembly successfully satisfied the average allowable temperature rise and maximum allowable single thermocouple temperature rise test acceptance criteria of the specified test standard for the full three hours of fire exposure. However, the Thermo-Lag wall failed to qualify as a 3-hour rated fire barrier enclosure. At 1 hour and 48 minutes (1:48) into the test, the average allowable temperature rise of 250 °F was exceeded. At 2 hours and 3 minutes (2:03), the maximum allowable single thermocouple temperature rise exceeded the 325 °F maximum limit.

The inspectors reviewed the licensee's UFSAR fire hazards analysis loading calculations for the cable spreading rooms A, B, switchgear B room, and ACP room (fire areas 1-A--CSRA, 1-A-CSRB, 1-A-SWGR-B, and fire zone 1-A-ACP). UFSAR Section 9.5.1.3 discusses the licensee's fire protection practice of determining the fire severity of a plant area. The UFSAR stated that the relative fire hazard (severity) of an area may be considered "LOW, MODERATE, or HIGH" based on each additional increment of 80,000 BTU/sq. ft. of fire loading. Also, for each increment increase in fire severity loading an

additional 1-hour of fire resistance rating for the barriers is needed. The licensee identified three plant areas where the fire loading exceeded 240,000 BTU per square foot (3-hours of fire resistance). These areas were the cable spreading rooms A, B, and the ACP room. Based on the above, the inspectors determined that at least a 3-hour in-situ fire severity loading existed in the areas adjacent to and exposing the Thermo-Lag fire barrier enclosures.

Based on the fire endurance test results, the licensee prepared a 10 CFR 50.59 safety evaluation (97-255) to evaluate the acceptability of the failed 3-hour test for the Thermo-Lag wall. This safety evaluation was transmitted to the NRC in a letter dated August 29, 1997, (Serial No. HNP-97-170), in response to NRC GL 92-08, "Thermo-Lag 330-1 Fire Barriers." Also, in a letter dated December 4, 1997(Serial No. HNP-97-211), the licensee transmitted a summary of the evaluation to incorporate the evaluation of ESR 95-00620, Revision 1, into the updated UFSAR (Amendment 48). The stated purpose of the evaluation was to determine the suitability of the existing Thermo-Lag enclosures as a fire barrier in the ACP room and CSRs. This involved revising the rating of the Thermo-Lag barriers in these areas from 3-hour rated to those which were suitable for the hazard. The evaluation included Calculations FP-0109, "Compartment Heat-up Analysis for Cable Spreading and ACP Rooms," Revision 0, and FP-0110, "Evaluation of Thermo-Lag Fire Barrier Enclosures Within the Cable Spreading and ACP Rooms," Revision 0. The purpose of these calculations was to assess room temperatures as a result of a postulated cable tray fire in the areas and assess the ability of the existing Thermo-Lag fire barrier enclosures to maintain acceptable temperatures on the unexposed side due to the postulated fire.

Harris Operating License NFP-63, Condition 4.2.F, "Fire Protection Program," specifies, in part, that Carolina Power and Light (CP&L) implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report (UFSAR) for the facility as amended and as approved in the Safety Evaluation Report (SER) dated November 1983 (and supplements 1 through 4), and the Safety Evaluation dated January 12, 1987.

Harris UFSAR Sections 9.5.1.2.2, "Barriers and Access," states that fire barriers with a minimum fire resistance rating of three hours are provided such that both redundant divisions or trains of safety-related systems are not subject to damage from a single fire to the extent possible in accordance with NRC position C.5.b.(2) of BTP CMEB 9.5-1 (NUREG-0800), July 1981. The Individual plant examination of external events (IPEEE) indicated that the ignition frequencies in these areas are significant. On the basis of the ignition frequencies and the combustible loading in these areas, the Thermo-Lag walls are considered to be important because they provide primary passive fire barrier separation between redundant trains of post-fire safe shutdown equipment. Under the conditions of a severe fire, there is a possibility that the Thermo-Lag wall could fail, and the redundant safe shutdown cables and equipment in both areas could be fire damaged.

The fire endurance testing demonstrated that the Thermo-Lag walls that serve as a portion of fire area separation barriers between the cable spreading rooms A and B and switchgear room B would provide a fire rating of 1 hour and 48 minutes for thermal performance in lieu of the 3-hour requirements of the approved fire protection program. This rating, however, may be questionable, considering the failed hose stream testing performed on the 1-hour test assembly. In the case of the B train switchgear room fire area, the inspectors noted that there was no automatic fire suppression. This issue may be significant since the Thermo-Lag fire wall was not designed or rated to bound the in-situ fire loading and the lack of diverse fire protection (i.e., no automatic sprinklers installed in the B switchgear fire area). A significant amount of cables exists in the ACP room, which is part of the B switchgear room fire area. Therefore, the inspectors viewed this reduction in the fire rating for these Thermo-Lag walls as non-conservative and may contribute to an increase in risk due to fire. The licensee had performed an evaluation of the acceptability of the Thermo-Lag fire barrier wall which considered the fire endurance test results. The inspectors did not perform a detailed review of the evaluation during this inspection. Region II requested the Office of Nuclear Reactor Regulation's (NRR) to evaluate this issue in Task Interface Agreement (TIA) 99-028, dated November 23, 1999. This issue will be identified and tracked as unresolved item (URI) 50-400/99-13-01, Adequacy of Thermo-Lag Fire Barrier to Meet Plant Licensing Basis Requirements. This issue is unresolved pending further NRC review to determine the adequacy of the protection provided by the Thermo-Lag fire barrier assemblies within the Cable Spreading and ACP Rooms.

2.2 <u>10 CFR 50.59 Evaluation for UFSAR Change</u>

a. <u>Inspection Scope</u>

The inspectors performed an independent technical review of the licensee's 10 CFR 50.59 evaluation 97-255 for ESR 95-00620 discussed above in Section 2.2 of this report. The change implemented by the licensee was evaluated in order to verify that the following requirements had been satisfied:

- That the licensee obtained NRC approval prior to implementing changes to licensing bases that result in a more than minimal increase in risk.
- That reduction in design margins for risk significant SSCs did not degrade the capability of the SSCs from performing their design functions.
- That changes were made in accordance with the requirements of 10 CFR 50.59.

b. <u>Observations and Findings</u>

The licensee's 10 CFR 50.59 evaluation 97-255 screen for ESR 95-00620 concluded that the fire barrier rating of the Thermo-Lag fire wall enclosures as established by actual fire testing was one hour and 48 minutes (1.8 hrs.), in lieu of the intended 3-hour fire endurance capability. The licensee's evaluation further determined that changes in the ratings of these fire area boundaries (which separated redundant divisions of safety-

related equipment) did not require prior NRC review and approval. As such, the licensee changed the UFSAR to revise the rating of the Thermo-Lag fire barriers in the switchgear room, ACP room, and cable spreading rooms from 3-hour barriers to one that was adequate for the hazard.

10 CFR 50.59 states that the licensee may make changes to the facility as described in the safety analysis report without prior Commission approval, unless the proposed change involves a change in the TS incorporated into the license or an unreviewed safety question. The NRC's response to question 8.4, "Future Changes," described in GL 86-10, stated that, if a future modification involves a change to a license condition or technical specification, a license amendment request must be submitted. When a modification not involving a technical specification or license condition is planned, the evaluation made in conformance with 10 CFR 50.59. If the evaluation finds that there is an impact that could result in the area either not being in conformance with Appendix R, or some other aspect of the approved fire protection program, or being outside the basis for an exemption that was granted for the area involved, the licensee must either make modifications to achieve conformance or justify and request exemption (or, for the post 1979 plants, approval) from the NRC. See also responses to Questions 8.1 and 8.2.

License Condition 2.C.4 to the Shearon Harris Operating License NPF-63 specifies that the licensee shall implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR for the facility as amended and as approved in the SER dated November 1983 (and supplements 1 through 4), and SER dated January 1987. The NRC based its approval of the Harris fire protection program on the licensee's commitment that it would meet Section C.5.a of BTP CMEB 9.5-1 as approved in Section 9.5.1.4 of the Harris SER, dated November 1983.

Changes were made to the UFSAR to revise the fire rating of the Thermo-Lag fire barriers in the switchgear room, ACP room, and cable spreading rooms from 3-hour barriers as approved in the SER, without prior Commission approval, that involved a change to an aspect of the approved fire protection program. The change to the Thermo-Lag barrier fire rating represented a 40% degradation (derating) of the margin of fire resistance from that established in the approved fire protection program. Region II requested NRR assistance in TIA 99-028 to evaluate this issue. This issue is identified as URI 50-400/99-13-02, Adequacy of the 10 CFR 50.59 for Changes Made to the UFSAR to Revise the Fire Rating of Selected Thermo-Lag Fire Barriers. This item is open pending NRR's review and determination of the adequacy of the 10 CFR 50.59 evaluation to support the FSAR change of the fire barrier rating from 3-hours to that which is adequate for the hazard.

2.3 Electrical Raceway Fire Barrier Systems Used to Protect Safe Shutdown Capability

a. Inspection Scope

The inspectors reviewed the technical adequacy of the "Hemyc Wrap" and "MT Wrap" fire barrier material used to separate safe shutdown functions within the same fire area. This review included evaluation of the material's application as a fire barrier system for

the protection of safe shutdown functions, and the fire endurance testing which substantiated the fire barrier systems' construction/installation attributes and their its ability to perform as 1-hour and 3-hour rated fire barriers. The inspectors reviewed the following documents:

- CTP 1026, "Fire Qualification Test of 'Hemyc' Cable Wrap System-One Hour," June 1, 1982, Central Nuclear de Asco, Tarragona, Spain.

- CTP 1071, "Three Hour Fire Qualification Test of Promatec 'MT' Barrier Wrap System-Electrical Conduit Circuits," January 6, 1986, Southwest Research Institute, San Antonio, Texas, Project No. 01-8305-049.

- CTP 1100A, "Three Hour Fire Qualification Test of Promatec 'MT' Barrier Wrap System-Electrical Cable Tray Circuits," June 4, 1986, Southwest Research Institute, San Antonio, Texas, Project No. 01-8821-016.

b. Observations and Findings

Fire protection features required to satisfy General Design Criterion (GDC) 3, "Fire Protection," included features to ensure that one train of those systems necessary to achieve and maintain safe shutdown conditions be maintained free of fire damage. One means for complying with this requirement was to separate one safe shutdown train from its redundant train with fire-rated barriers. The level of fire resistance required, 1-hour or 3-hours, depended on the other fire protection features provided in the fire area of concern.

The NRC issued guidance on acceptable methods of satisfying the regulatory requirements of GDC 3 in Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guideline for Fire Protection for Nuclear Power Plants;" Appendix A to BTP APCSB 9.5-1; BTP Chemical Engineering Branch (CMEB) 9.5-1 "Fire Protection for Nuclear Power Plants," July 1981: Generic Letter (GL) 86-10, "Implementation of Fire Protection Requirements," April 24, 1986; and Supplement 1 to GL 86-10, " Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used To Separate Redundant Safe Shutdown Trains Within the Same Fire Area," March 25, 1994.

Harris UFSAR Section 9.5.1.2.2.1, "Safe Shutdown Capability," states that where cable or equipment ... of redundant safe shutdown divisions of systems necessary to achieve and maintain cold shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant divisions is free of fire damage is provided: (a) Separation of cables and equipment and associated circuits of redundant safe shutdown divisions by a fire barrier having a 3-hour rating except as described in Section 9.5.1.2.4; (b) Separation of cables and equipment and associated circuits of redundant safe shutdown divisions by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards; (c) Enclosure of cables and equipment and associated circuits of redundant safe shutdown divisions by a fire barrier having a 1-hour rating.

During plant licensing, Shearon Harris SER Supplement 4, Section 9.5.1.1, "Fire Protection Program Requirements," incorporated the guidance of GL 86-10, "Implementation of Fire Protection Requirements," dated April 24, 1986, into the UFSAR by reference.

In the BTPs and in GL 86-10, the NRC staff stated, in part, that the fire resistance rating of fire barriers should be established in accordance with National Fire Protection Association (NFPA) Standard 251, "Standard Methods of Fire Tests of Building Construction and Materials." A test specimen should represent the materials, workmanship, method of assembly, dimensions, and configuration for the fire rating desired. In GL 86-10, and its Supplement 1 the staff included guidance on fire test acceptance criteria and for evaluating deviations from tested configurations. The guidance in GL 86-10 did not change the requirement to separate one safe shutdown train from its redundant train with either a 1-hour or a 3-hour fire rated barrier.

Hemyc Wrap and MT cable wrap fire barrier systems were used at Harris to maintain one train of post-fire safe shutdown capability free of fire damage and to provide the needed assurance that one train of post-fire safe shutdown capability would be immediately available to perform their intended function. Both Hemyc and MT cable wrap systems are manufactured by Promatec Technologies, Inc..

The inspectors performed a review and evaluation of the Hemyc /MT cable wrap fire barrier systems' qualification testing documentation. Fire barrier test designation CTP-1026 for the Heymc 1-hour rated fire wrap system and CTP-1071 for the MT 3-hour rated fire wrap system serve as the plants qualification bases for the cable wrap fire barrier systems.

The fire barrier acceptance criteria used for the Hemyc /MT cable wrap fire barrier systems was based on that reflected by American Nuclear Insurers (ANI) as specified in ANI Information Bulletin 5(79), "ANI/MAERP Standard Fire Endurance Test Method to Qualify a Protective Envelope for Class 1E Electrical Circuits," July 1979. The ANI test methodology, as specifically noted on the cover letters for the test reports provided to the inspectors by the licensee, stated that the tests reports were issued for insurance purposes only, and were not be considered the equivalent of rated fire barriers, where required. Additionally, in 1994, Supplement 1 to GL 86-10 addressed NRC concerns with the ANI test methodology. In lieu of monitoring the unexposed surface temperature of the fire barrier test specimen, the ANI test specifies that cables within the fire barrier test specimen be monitored for temperature and circuit integrity (pass a low voltage circuit integrity test) while the test specimen is subjected to a test fire that follows the standard time-temperature curve. If cable circuit integrity is maintained, the test is considered successful. The ANI test methodology does not specify the following GL 86-10 acceptance criteria:

(1) The fire barrier design has withstood the fire endurance test without the passage of flame or the ignition of cotton waste on the unexposed side for a period of time equivalent to the fire-resistance rating required of the barrier.

(2) Analysis of temperature levels recorded on the unexposed side of the fire barrier demonstrates that the maximum temperature rise does not exceed 139 °C [250 °F] above ambient temperature.

(3) The fire barrier remains intact and does not allow water to be projected beyond the unexposed surface during the hose stream test.

The NRC considers using the ANI monitoring approach nonconservative in that cable damage can occur without indication of excessive temperatures on the cables. This, linked with no loss of circuit integrity, would give indications of a successful test. Enclosure 1, "Interpretations of Appendix R," to GL 86-10, provided additional guidance with respect to the term "free of fire damage" as used in Appendix R. Interpretation 3, "Fire Damage," stated: "In promulgating Appendix R, the Commission has provided methods acceptable for assuring that necessary structures, systems, and components are free from fire damage (see Section III.G.2a, b, and c), that is, the structure, system or component under consideration is capable of performing its intended function during and after the postulated fire, as needed."

The licensee was unable to provide the inspectors with engineering evaluation documentation which demonstrated that the shutdown capability is protected. For example, the cables for redundant trains of safe shutdown related functions throughout the plant and both trains of onsite diesel generator power cables routed through fire zone 4-A-CHLR (where the offsite power bus ducts are also routed) are wrapped with cable wrap fire barrier systems. As a result, all power supplied to the 6.9kV Emergency Switchgear 1A-SA and 1B-SB is susceptible to total loss if a substantial fire were to occur in this fire zone and the cable wrap fire barrier system protecting the Emergency Diesel Generators 1A(1B) feeder cables were to fail. The licensee had not previously analyzed this condition for the effects on off-site power.

Additionally, the inspectors were unable to confirm that the licensee had established an acceptable design basis for the Hemyc/MT cable wrap fire barrier systems used to separate safe shutdown functions within the same fire area. The licensee stated that CP&L was currently implementing a comprehensive design basis program for fire protection systems and feature, including passive features such as penetrations seals and Hemyc/MT cable wrap fire barrier systems. As part of this effort, as-built plant configurations are to be validated against documented design basis requirements established by the fire endurance qualification testing documentation and evaluations completed for fire barrier conditions that vary from the tested configurations. It did not appear that an adequate design basis had been established for fire protection cable wrap fire barrier systems which incorporated the guidance of GL 86-10.

The inspectors concluded that the actual fire resistive performance of the Hemyc/MT cable wrap fire barrier systems installed to separate safe shutdown functions within the same fire area was indeterminate. There was uncertainty as to whether or not the ANI test method established a level of fire barrier performance equivalent to that established by the GL 86-10 acceptance criteria, and may not have provided reasonable assurance that the cables protected by the cable fire barrier systems would be capable of

performing their intended post-fire safe shutdown function during and following a fire. Region II requested NRR's assistance in TIA 99-028 to evaluate this issue. This issue is identified as URI 50-400/99-13-03, Adequacy of Hemyc/MT Cable Wrap Fire Barrier Qualification Tests and Evaluations to Scope Installed Configurations. This item remains open pending NRR review to determine whether the licensee's use of the Hemyc and Promatec "MT" fire barrier wrap systems as qualified one-hour and three-hour fire barriers is acceptable.

2.4 Fire Brigade Drill Program

a. Inspection Scope

The inspectors reviewed the fire brigade drill program, observed a fire brigade response associated with an unannounced fire brigade drill, and reviewed selected audits of the fire protection program performed by the Harris Nuclear Assessment Section (HNAS).

b. Observations and Findings

The inspectors witnessed an unannounced fire brigade drill (Serial NO. 99-D-07) for an operations shift, on November 3, 1999. The fire scenario, involved a simulated fire in the Battery Charger 1A-SB located in the B train 1B-SB Switchgear Room (Fire Area 1-A-SWGR-B). The brigade demonstrated good fire fighting tactics, the proper use of the pre-fire plan and fire fighting equipment, and adequate recovery operations. The fire brigade leader's direction and performance was also good. The fire brigade leader dispatched two fire brigade members to the 1-A-SWGR-A, Switchgear Room to inspect the area to ensure no fire existed that could affect A train safe shutdown equipment in this area. Control room activities in response to the drill were timely and in accordance with procedures.

The critique of this drill was effective in identifying a pre-fire plan area of improvement involving noting in the pre-fire plan the availability of fire hose stations in the Turbine Building for use when accessing the switchgear rooms. The licensee initiated Document Change Form (DCF) no. 1999P20294 to correct the identified pre-fire plan drawing inconsistency, which had no significant effect on fire brigade operation. The nominal fire brigade performance response time to place an effective fire suppression agent on the fire was about 18 minutes. The overall brigade drill performance was judged to have been satisfactory.

No findings were identified and documented in relation to the fire brigade drill performance.

The inspectors observed that the drill critique data for shift fire drills conducted during the past three-year period indicated that effective response by the fire brigade may have been somewhat reduced throughout several years. The inspectors reviewed selected HNAS assessment reports and noted that a number of issues had been identified concerning fire brigade drill performance deficiencies (Issue No. H-FP-97-01-I1) and the quality and use of pre-fire plans (H-FP-98-01-W1 and H-FP-98-02-I2). Also, the NRC

identified a concern regarding the lack of fire brigade drills scheduled in the switchgear areas. Until recently, no fire drills had been scheduled within the switchgear areas in at least the past seven years. This concern was documented in CR 99-01973 and discussed in NRC inspection report 50-400/99-05.

### 3. Post-fire Safe Shutdown Circuit Analysis

a. Inspection Scope

Harris Updated Final Safety Analysis Report (UFSAR) Section 9.5.1 described the plant fire protection program. UFSAR Section 7.4.1 referred to the safe shutdown analysis for safe shutdown following a fire. The safe shutdown analysis documented the analysis of the plant against the criteria of Standard Review Plan (SRP) 9.5.1 (NUREG-0800) which contained the technical requirements of Branch Technical Position (BTP) Chemical Engineering Branch (CMEB) 9.5-1 "Fire Protection for Nuclear Power Plants," July 1981. CMEB 9.5-1, position C.5.b requires that one train of systems necessary to achieve and maintain hot shutdown conditions be maintained free of fire damage by separation and/or fire protection features which meet the requirements of positions C.5.b(2)(a), C.5.b(2)(b), or C.5.b(2)(c).

On a sample basis, the adequacy of separation provided for power and control cabling associated with redundant trains of equipment necessary to achieve and maintain safe shutdown was reviewed for fire areas 12-A-CR/CRC1, 1-A-SWGR-A, 1-A-SWGR-B, and 1-A-BAL-B. The inspectors focused on functions required to achieve and maintain hot shutdown conditions, and included: electrical power distribution; reactivity control; reactor coolant system inventory control; reactor pressure control; reactor heat removal; essential mechanical support; and essential environmental support functions. Specifically, the evaluation included power and control cables associated with components of the auxiliary feedwater (AFW), component cooling water (CCW), chemical and volume control (CVCS), emergency diesel generator (EDGS), emergency service water (ESW), safety injection (SIS) and residual heat removal (RHR) systems.

The evaluation of separation of required safe shutdown functions was based on a comparison of cable routing information retrieved from the plant's computerized cable and raceway function report C15; post-fire safe shutdown analyses documented in calculations E-5524, " Safe Shutdown Separation Analysis," Revision 2 and E-5525, Revision 1, "Safe Shutdown Analysis in Case of Fire," and conduit and cable tray routing drawings provided by the licensee. For the purpose of this review, an interaction was identified whenever cables of redundant shutdown paths and/or divisions were shown on the cable and raceway function report and cable tray routing drawings as being in the same fire area. Following their identification, the safe shutdown separation analyses methodology for providing an acceptable resolution was evaluated. This evaluation included a review of the post-fire safe shutdown analysis and supporting calculations to determine if the interactions had been properly identified and dispositioned.

b. Observations and Findings

For the sample of circuits reviewed, no findings were identified and documented during this inspection. The licensee initiated Engineering Service Request (ESR) 99-00415 to correct five inspector identified drawing inconsistencies, which had no significant effect on plant operation.

**4. Alternative Shutdown Capability**

a. Inspection Scope

The inspectors reviewed selected licensee calculations, AOPs, and surveillance procedures to verify the adequacy of the design and implementation of the alternative shutdown capability for selected plant fire areas. The inspectors also reviewed the licensee's alternative shutdown methodology to determine the identified components and systems necessary to achieve and maintain safe shutdown conditions. This included: (1) verifying that the methodology addressed achieving and maintaining hot and cold shutdown from outside the main control room (MCR) with off-site power available or not available; and (2) verifying that the transfer of control from the MCR to the alternative location had been demonstrated to not be affected by fire-induced circuit faults.

b. Observations and Findings

There were no findings identified and documented during this inspection.

**5. Operational Implementation of Alternative Shutdown Capability**

a. Inspection Scope

The inspectors reviewed the operational implementation of the alternative shutdown capability for Fire Areas 12-A-CR/CRC1 (Control Room/Control Room Complex) to verify that: (1) the training program for licensed personnel included alternative or dedicated safe shutdown capability; (2) personnel required to achieve and maintain the plant in hot shutdown following a fire using the alternative shutdown system could be provided from normal onsite staff, exclusive of the fire brigade; (3) adequate procedures for use of the alternative shutdown system existed and the operators could reasonably be expected to perform the procedures within applicable shutdown time requirements; (4) the licensee had incorporated the operability of alternative shutdown transfer and control functions into the plant technical specifications; and (5) the licensee periodically performed operability testing of the alternative shutdown instrumentation and transfer and control functions, including imposing appropriate compensatory measures during testing when the alternative shutdown capability may be declared inoperable.

b. Observations and Findings

There were no findings identified and documented during this inspection.

**6. Communications for Performance of Alternative Shutdown Capability**

a. Inspection Scope

The inspectors walked down the remote shutdown equipment identified in procedure AOP-036 in the in the switchgear rooms A and B and the ACP room and verified that sound-powered phone jacks were at the locations identified in the procedure. The inspectors' observations of the material condition of selected sound-powered phone stations found that the sound-powered phone jacks were in good condition, free of foreign material, and installed at the proper locations to support required shutdown actions identified in the AOP-036 procedure.

Observations and Findings

b. There were no findings identified and documented during this inspection.

**7. Emergency Lighting for Performance of Alternative Shutdown Capability**

a. Inspection Scope

The inspectors reviewed the design and operation of the 8-hour battery powered emergency lighting and the ACP room dc emergency light systems.

The inspectors' reviewed emergency lighting drawings CPL 2165-S-sheets 1000-1006, "Emergency Lighting and Access/Egress Path Layout," and verified that the emergency lighting design drawings for the 8-hour battery powered emergency lighting system installed in switchgear rooms A and B and the ACP room were properly provided to allow access to safe shutdown equipment and performance of manual actions reflected in AOP-036 for these areas.

The inspectors walked down remote shutdown equipment identified in procedure AOP-036 in the switchgear rooms A and B and the ACP room and inspected approximately 25 lighting units designated on the emergency lighting drawings. The purpose of the walk down was to verify that the emergency lighting unit lamps were operational and the lighting heads were aimed to provide adequate illumination to perform the required shutdown actions denoted in the procedure.

The ACP room was not provided with 8-hour battery powered emergency lighting units. In the ACP room the plant dc emergency lighting system was used. The inspectors reviewed the cable routing for the dc emergency lighting system and verified that the cables were separated so that a single fire will not cause loss of the lighting capability in the ACP room.

b. Observations and Findings

There were no findings identified and documented during this inspection.

## V. MANAGEMENT MEETINGS

### EXIT MEETING SUMMARY

The lead inspector discussed the progress of the inspection with licensee representatives on a daily basis and presented the preliminary results to members of licensee management and staff during a pre-exit at the conclusion of the onsite inspection on November 5, 1999. Subsequent to the onsite inspection, the licensee provided additional information to the inspectors for review. After reviewing the additional information, the inspectors and Region II management held the formal exit by telephone with licensee management on December 20, 1999. The licensee stated their belief that the three unresolved items are not findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

## PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Alexander, Manager, Regulatory Affairs
C. Burton, Director, Site Operations
J. Eads, Supervisor, Licensing/Regulatory Affairs
R. Field, Manager, Nuclear Assessment Section
P. Fulford, Superintendent, Technical Services, Harris Engineering Support Section (HESS)
L. Garner, Supervisor, Maintenance
C. Georgeson, Safe Shutdown Engineer, HESS
B. Gerwe, Fire Protection Engineer, Robinson Engineering Support Section
W. Gregory, Operations Fire Protection Coordinator
W. Gurganious, Supervisor, Technical Training
S. Hardy, Principle Analyst, Nuclear Engineering Design
T. Hobbs, Manager, Operations
C. Jernigan, Superintendent, Shift Operations
D. McAfee, Fire Protection Program Manager, HESS
A. Morisi, Supervisor, Electrical/I&C Design, HESS
M. Munroe, Superintendent, Operations Support
S. Saunders, Supervisor, Emergency Core Cooling System, HESS
J. Scarola, Vice President, Harris Plant
R. Sims, Fire Protection Engineer, Brunswick Engineering Support Section
V. Stephenson, Superintendent, Mechanical Systems Engineering, HESS
M. Wallace, Senior Analyst, Licensing/Regulatory Programs

Other licensee employees contacted included engineers, operations personnel, maintenance personnel, and administrative personnel.

NRC:

J. Brady, Senior Resident Inspector
R. Hagar, Resident Inspector
P. Koltay, Office of Nuclear Reactor Regulation (NRR)
P. Qualls, (NRR)
V. McCree, Deputy Director, Division of Reactor Safety, Region II

## INSPECTION PROCEDURES USED

IP 71111.05, Fire Protection

## ITEMS OPENED, CLOSED, OR DISCUSSED

Opened

| | | |
|---|---|---|
| 50-400/99-13-01 | URI | Adequacy of Thermo-Lag Fire Barrier to Meet Plant Licensing Basis Requirements (Section 2.1) |
| 50-400/99-13-02 | URI | Adequacy of the 10 CFR 50.59 for Changes Made to the UFSAR to Revise the Fire Rating of Selected Thermo-Lag Fire Barriers (Section 2.2) |
| 50-400/99-13-03 | URI | Adequacy of Hemyc/MT Cable Wrap Fire Barrier Qualification Tests and Evaluations to Scope Installed Configurations (Section 2.3) |

## APPENDIX

## LIST OF DOCUMENTS REVIEWED

### PROCEDURES

AOP-004, Remote Shutdown, Revision 18

AOP-036, Safe Shutdown Following a Major Fire, Revision 7

EPT-709T, Temporary Procedure for MCB to ACP Manual Transfer - Functional Test (Expires 12/31/95), Revision 0

FPP-001, Fire Protection Program Manual, Revision 19

OMM-002, Shift Turnover Package, Revision 17

OST-1813, Remote Shutdown System Operability 18 Month Interval Modes 5, 6, or Defueled, Revision 15

### CALCULATIONS

Calculation E-5524, Safe Shutdown Separation Analysis, Revision 2

Calculation E-5525, Safe Shutdown Analysis in Case of Fire, Revision 2

### DRAWINGS

CPL 2165-S, Emergency Lighting and Access/Egress Path Layout, Sheets 1000-1006

### ASSESSMENT REPORTS

H-FP-98-01, Harris Fire Protection Assessment, dated January 29, 1998

H-FP-98-02, Harris Fire Protection, dated January 29, 1999

50-400
12/28/99
99-12



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December 28, 1999

Carolina Power & Light Company
ATTN: Mr. James Scarola
Vice President - Harris Plant
Shearon Harris Nuclear Power Plant
P. O. Box 165, Mail Code: Zone 1
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SUBJECT: NRC INSPECTION REPORT NO. 50-400/99-12

Dear Mr. Scarola:

This refers to the inspection conducted on November 15 - 19, 1999, at your Harris facility. This was a special team inspection covering activities related to the planned expansion of the Shearon Harris spent fuel pool. The objectives of this inspection were to assess the implementation of the construction quality assurance program in construction of the C and D spent fuel pools, evaluate the alternate weld inspection program, and evaluate the plans for commissioning of the equipment for the C and D spent fuel pools (SFP).

The inspection found that CP&L had a comprehensive program to control, inspect, and document welding at the time of original plant construction in accordance with Section III of the ASME Boiler and Pressure Vessel Code, and NRC requirements. The inspection also found that the alternate weld inspection program was adequate to provide assurance that the welds for which documentation was missing, met design requirements. The program for commissioning of the C and D SFP equipment will be examined in an inspection tentatively planned for January 24 - 28, 2000. No violations of NRC requirements were identified during the inspection.

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,
original signed by:
Harold O. Christensen/for
Kerry D. Landis, Chief
Engineering Branch
Division of Reactor Safety

Docket No. 50-400
License No. NPF-63

Enclosure: NRC Inspection Report

cc w/encl: (See page 2)

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-400

License Nos.: NPF-63

Report Nos.: 50-400/99-12

Licensee: Carolina Power & Light Company (CP&L)

Facility: Shearon Harris Nuclear Power Plant, Unit 1

Location: 5413 Shearon Harris Road
New Hill, NC 27562

Dates: November 15 - 19, 1999

Team Leader: J. Lenahan, Senior Reactor Inspector
Engineering Branch
Division of Reactor Safety

Inspectors: B. Crowley, Senior Reactor Inspector
K. Heck, Quality Assurance Engineer, NRR
D. Naujock, Materials Engineer, NRR

Approved By: Kerry D. Landis, Chief
Engineering Branch
Division of Reactor Safety

# SUMMARY OF FINDINGS

Shearon Harris Nuclear Power Plant
NRC Inspection Report 50-400/99-12

The fuel pool cooling systems are described in Section 9.1.3 of the licensee's Updated Final Safety Analysis Report (UFSAR). The design basis for pools A and B, which support the operation of Unit 1, is identical to that for pools C and D. Because these pools are located in a single building and major system components needed to be installed during the early phase of construction, procurement and installation of the major system components for all four spent fuel pools was performed concurrently, in the late 1970s and early 1980s. In a letter dated December 23, 1998, the licensee requested an amendment to the Shearon Harris facility operating licensee to place spent fuel pools (SFP) C and D in service to increase the onsite spent fuel storage capacity. The licensee is currently operating and storing fuel in the A and B SFP. The majority of the C and D SFP were completed prior to 1982 during plant construction.

During preparation of the plans for completion of the C and D SPF, the licensee discovered that documentation for 52 welds on ASME Class III piping had been inadvertently destroyed. The 52 welds were 40 piping welds and 12 welded attachments for pipe hangers (lugs). The 40 piping welds included 15 spent fuel system welds which are embedded in concrete, 22 accessible spent fuel system welds, and 3 accessible component cooling system welds. Three of the accessible spent fuel system welds were subsequently removed and replaced with new welds, resulting in 37 piping welds with missing records. The most significant missing documents were the weld data reports (WDRs) for each of the welds. In order to demonstrate the weld quality for the welds with missing documentation, the licensee developed and implemented an alternative inspection program.

This special inspection included a review of the construction quality assurance (QA) and quality control (QC) program; the original construction QA/QC records; the licensee's alternative inspection program for welds with missing QA/QC records; the engineering service requests prepared to complete the C and D SFP; a walkdown inspection of the accessible C and D SPF components; and the licensee's program for commissioning of the C and D SFP. The inspectors used Temporary Instruction (TI) 2515/143 for guidance during this inspection.

The inspection found that the licensee had a comprehensive program to control, inspect, and document welding at the time of original construction in accordance with Section III of the ASME Boiler and Pressure Vessel Code, and NRC requirements. The inspection also found that the licensee's alternative weld inspection program was adequate to provide assurance that the welds for which documentation was missing, met design requirements. The licensee's program for commissioning of the C and D SFP equipment should ensure that existing equipment meets design requirements and will perform its design function. An Inspector Followup Item (IFI) was opened to inspect implementation of the equipment commissioning process. No violations were identified.

## REPORT DETAILS

## 1. REVIEW OF THE LICENSEE'S CONSTRUCTION QUALITY ASSURANCE PROGRAM

### 1.1 Review of Quality Assurance and Quality Control Procedures

Inspection Scope

The inspectors reviewed Quality Assurance (QA) and Quality Control (QC) procedures that implemented the QA program requirements during construction.

Observations and Findings

The inspectors reviewed the licensee's ASME Quality Assurance Manual for the Construction of the Shearon Harris Nuclear Power Plant transmitted to NRC by letter dated dated April 30, 1999. This Manual described the quality assurance program that implemented the quality assurance requirements of ASME Boiler and Pressure Vessel Code, Section III, Division 1, Nuclear Power Plant Components, and applicable Federal, State and local regulations and codes. The Manual was applicable to fabrication and construction of ASME components which include the A, B, C and D spent fuel pools.

The inspectors reviewed the implementing QA and QC procedures listed below which controlled activities relating to weld quality. The procedures revisions were applicable to the time during 1979-1981 when the major weld activity for construction of the spent fuel pools occurred. Procedures reviewed were as follows:

| Number, Revision | Title |
|---|---|
| CQA-1, Rev. 5 | Personnel Training and Qualification |
| CQA-2, Rev. 0 | QA Document Control |
| CQA-4, Rev. 5 | QA Records |
| CQA-8, Rev. 3 | Material Issue Surveillance |
| CQA-12, Rev. 0 | Mechanical Equipment Installation Monitoring |
| CQA-14, Rev. 0 | Application and Control of "N" Type Symbol Stamps |
| CQA-15, Rev. 0 | Assignment and Control of National Board Serial Numbers |
| CQA-16, Rev. 0 | Preparation and Submittal of ASME Code Data Reports |
| CQA-18, Rev. 0 | Control of Site Fabrication/Modification of Piping Subassemblies |
| CQA-20, Rev. 0 | Surveillance of Contractor Welding and Related Activities |
| CQA-22, Rev. 0 | Welding Activity Monitoring |
| CQA-24, Rev. 0 | Procurement Control |
| CQA-28, Rev. 0 | QA Surveillance |
| CQA Appendix A | Quality Assurance Forms |
| CQC-2, Rev. 3 | Nonconformance Control |
| CQC-4, Rev. 3 | Procurement Control |

CQC-6, Rev. 0Receiving Inspection
CQC-8, Rev. 3Storage Control
CQC-10, Rev. 0 Cleanness Control
CQC-12, Rev. 0 Mechanical Equipment Installation Control
CQC-13, Rev. 0 Concrete Control
CQC-19, Rev. 0 Weld Control
CQC-20, Rev. 0 Post-Weld Heat Treatment Control
CQC-22, Rev. 3 Hydrostatic Test Inspection
CQC-23, Rev. 0 Systems Turnover

The procedures were consistent with the CP&L QA program, established by the ASME QA Manual and NRC requirements, and defined specific process requirements in sufficient detail to provide for QA/QC control of welding activities.

A detailed review was performed for procedures CQC-19, Weld Control; CQC-22, Hydrostatic Test Requirements; and CQC-13, Concrete.Control. This review was directed toward determining an alternate method to ascertain the quality of the field welds for which certain records were missing. These procedures are described below.

Weld Control

CQC-19 assigned the Welding QA/QC Specialist the responsibility for: review and verification of data and designated hold points in the Weld Data Reports (WDRs); ensuring completed WDRs for code welds were forwarded to the Authorized Nuclear Inspector (ANI) for review; supervising the QC Inspectors in the performance of weld inspections; and monitoring activities related to welding. QC inspection personnel were trained and qualified in accordance with CQA-1. The SFP field welds, which were ASME Code Class 3 welds, were documented on a WDR , reviewed and approved by the Welding QA/QC Specialist, and reviewed for acceptance by the ANI. The ANI performed an independent third party review. The responsibilities of the Welding QA/QC Specialist and QA inspection personnel were sufficiently defined to provide reasonable assurance that the quality of the completed field welds were in compliance with applicable ASME Code requirements. After the documentation of a field weld was determined to be acceptable, pertinent documents were assembled and the package was transmitted to QA Records in accordance with CQA-4.

Hydrostatic Test Inspection

CQC-22 established the requirements for performing hydrostatic test inspections to ensure that hydrostatic tests were performed in accordance with approved procedures and specifications. The Mechanical QA Specialist was responsible for verifying that the documentation for the piping was completed prior to performance of the hydrostatic test. This included verification that field welds within the scope of a hydrostatic test had been satisfactorily completed, inspected, and accepted. The Mechanical QA Specialist was also responsible for performance of the leak inspection during hydrostatic testing. QC inspection personnel also witnessed the test. The responsibilities of the Mechanical QA Specialist and QC inspection personnel were sufficiently defined to provide assurance

that the quality of hydrostatic testing was in compliance with applicable procedures and specifications. After the documentation for a hydrostatic test had been accepted by the ANI, the pertinent documents were assembled and reviewed by the Mechanical QA Specialist, who verified that manufacturing/fabrication records for components within the boundaries of the test had been received and accepted and that there were no open nonconformances on any of the components.

Concrete Placement

CQC-13 and Construction Procedure WP-05, Concrete Placement, established the requirements for assuring all work activities in the area affected by a concrete pour were completed prior to placement of concrete. A prerequisite to placement of concrete was the completion of a Concrete Placement Report, which signified that all activities in the affected area had been satisfactorily completed such that access to the area to be covered with concrete was no longer required. When specific crafts completed their work, the appropriate Craft Superintendent signed off the Concrete Placement Report, signifying that a particular activity, such as mechanical, electrical, cadwelds, nondestructive examination, or cleanup, was complete and ready for the concrete pour. This sign-off was required by all Craft Superintendents, whether or not they had work in the particular placement, as a safeguard against omissions. After sign-off by the Craft Superintendents, Field Engineering signed the Concrete Placement Report, verifying that required design attributes, such as the correct location and anchoring of embedded conduit, grounding, inserts, sleeves, piping, and plumbing, were complete and correct. When all the crafts had completed their work, the Construction Inspector signed the report, signifying that all work had been inspected and approved. Subsequently, Quality Control and Quality Assurance signed the report signifying that all of their oversight activities were completed and that the items to be embedded in the concrete were in compliance with applicable requirements. Finally, after all required disciplines, QA, Construction Inspector and design approval sign-offs were completed, the Area Superintendent authorized concrete placement activities to proceed. The completed Concrete Placement Report was transmitted to QA Records in accordance with CQA-4.

Conclusions

The QA/QC procedures in effect at the time of construction of the SFP provided comprehensive control of welding and other construction activities. The procedures provided holdpoints to assure welding was completed in accordance with ASME and NRC requirements prior to proceeding beyond a point wherein any nonconformances could be resolved. These included a detailed review of weld documentation to assure the welds were completed in accordance with technical requirements, and that the welds were inspected and tested prior to being subjected to a hydostatic pressure test. For welds which were to be embedded in concrete, completion of the Concrete Placement Report provided an additional holdpoint to assure the welds were satisfactory prior to placement of concrete. The ANI provided an independent third party review of the ASME welding program.

## 1.2 Review of Welding Process Control Procedures

Inspection Scope

The inspectors reviewed original construction welding process control procedures, which were in effect at the time the existing Fuel Pools "C" and "D" equipment and piping were installed, as detailed below.

Observations and Findings

The welding control procedures listed below were reviewed to verify that a quality assurance program was in place at the time of installation of Fuel Pools "C" and "D" piping to ensure that pipe welding was accomplished in accordance with applicable Code requirements. The procedure revisions were those applicable when the welding activities for the fuel pools were in progress. Procedures reviewed were as follows:

MP-01, Revisions 3, 5, 6, and 7, Qualifying of Welding Procedures

MP-02, Revision 4, Procedure for Qualifying Welders and Welding Operators

MP-03, Revisions 1, 3, and 4, Welding Material Control

MP-06, Revisions 3, 4, and 5, General Welding Procedure for Carbon Steel Weldments

MP-07, Revisions 3 and 4, General Welding Procedure for Stainless Steel Nickel Base and Nonferrous Weldments

MP-09, Revisions 1, 9, and 10, Welding Equipment Control

MP-10, Revisions 2 and 3, Repair of Base Materials and Weldments

MP-11, Revisions 3, 4, and 5, Training and Qualification of Metallurgical/Welding Engineering and Support Personnel

MP-12, Revisions 1, 2, and 3, Control of Special Welding Materials for BOP and Welding Material for Non-Permanent Plant

MP-13, Revisions 1 and 2, Welder Qualification for Areas of Limited Accessibility

The procedures provided detailed control for all aspects of the welding process, including qualification of procedures and welders, control of welding materials, control of welding variables, and quality documentation for each weld.

Conclusions

At the time of original construction of the existing fuel pool cooling system piping, a comprehensive welding program was in place to control and document pipe welding in accordance with Section III of the ASME Boiler and Pressure Vessel Code.

## 2. REVIEW OF CONSTRUCTION QA/QC RECORDS

### 2.1 Review of Hydrostatic Test Reports

Inspection Scope

The inspectors reviewed the records documenting the results of hydrostatic testing performed on the piping welds embedded in the C and D fuel pool concrete.

Observations and Findings

The inspectors reviewed the records which documented completion of hydrostatic testing in accordance with WP-115 and the licensee's quality assurance program. Records examined were for the following C and D fuel pool embedded piping welds numbers : 2-SF-1-FW-1, -2, -4, & -5; 2-SF-149-408; 2-SF-143-512, 513, & -514; 2-SF-144-FW-515, -516, & -517; and 2-SF-159-FW-518 & -519. These records were documented on CP&L form QA-26, pages one and two of two, Hydrostatic Test Records. Information on the data sheets included the hydrostatic test boundaries (welds tested), the piping design pressure, test pressure, the test medium and test temperature, test data, and the test results. The test prerequisites required that the mechanical QA specialist verify that all required piping documentation was completed, and that all required weld documentation was completed. The inspectors verified that the hydrostatic test records specified that all weld records were completed, and that the welds were accepted by the quality assurance group prior to start of the hydrostatic test. The inspectors also verified that the records had been signed by the ANI. The hydrostatic test records for the above welds showed that all welds were tested to a minimum of 25 percent above design pressure and that all welds met the test acceptance criteria. The licensee did not retain copies of the form QA-26 for embedded weld numbers 2-SF-8-FW-65 & -66. However, in response to questions during construction regarding hydrostatic testing of the welds attaching the liner plate to the piping spool pieces, the licensee initiated Deficiency and Disposition Report (DDR) 794. Resolution of this DDR included documentation of the dates various welds were hydrostatically tested. The dates the welds for piping spool pieces were hydrostatically tested (July 19, 1979 and July 24, 1979) were listed in the DDR response. These included weld numbers 2-SF-8-FW-65 & 66. The inspectors concluded that the documentation for DDR-794 provided evidence that weld numbers 2-SF-8-FW-65 & 66 were subjected to hydrostatic testing in accordance with WP-115 and the licensee's quality assurance program.

Conclusions

The hydrostatic test records documented that the embedded welds were subjected to hydrostatic testing, and met the test acceptance criteria. The records also provided evidence that the welds were completed, inspected and documented in accordance with the licensee's quality assurance program. The hydrostatic test records provide evidence that the WDRs were reviewed prior to performance of the hydrostatic tests.

## 2.2 Review of Concrete Placement Reports

Inspection Scope

The inspectors reviewed the concrete placement records for spent fuel pools C and D which documented that all work and preparations for the concrete placements were completed and that all required inspections had been completed prior to placement of concrete.

Observation and Findings

Prior to placement of concrete, a concrete placement report was completed to document that all work activities have been completed in a particular area (slab, column, wall, etc) and that the concrete placement could proceed. The inspectors reviewed drawing numbers SK A-G-0126, South Fuel Pool Area of FHB Isometric, and SK A-G-0125, FHB Isometric North Fuel Pool Units 2 & 3, to determine the concrete placement numbers which contained the embedded piping for the C and D fuel pool cooling system. This review showed that the piping had been installed in the following C & D fuel pool placement numbers: wall placements W-255-7, W-261-7, -7A, -9, -10, and -11, W-281-10, -16, -17, and -18, and slab placements SL-246-3 and SL-246-4. The inspectors reviewed the placement report for the above listed placement numbers and verified that the placement reports had been properly completed and signed prior to placement of concrete. The inspectors verified that the mechanical embed/piping had been signed in accordance with CP&L procedure WP-05. The acceptance criteria noted on the placement reports for mechanical embed/piping was CP&L procedure WP-102, Installation of Piping. Procedure WP-102 required that a verification be performed to assure that all piping was installed as per the design drawings. Additional requirements referenced by procedure WP-102 were that hydrostatic testing of piping to be embedded in concrete was to be completed in accordance with CP&L procedure WP-115, Hydrostatic Testing of Buried or Embedded Piping.

Conclusions

The concrete placement reports provide evidence that the piping embedded in the concrete was inspected and tested in accordance with the requirements of the licensee's construction quality assurance program prior to concrete placement. These requirements included verification that the welding was completed in accordance with applicable procedures, and that documentation such as WDRs were completed and reviewed prior to the concrete placement.

## 2.3 Review of ASME Documentation

Inspection Scope

The inspectors reviewed completed documentation required by the ASME Boiler and Pressure Vessel Code for the fuel pool cooling systems.

Observation and Findings

10 CFR 50.55, "Codes and standards," requires that systems and components of pressurized water-cooled nuclear reactors meet certain requirements of the ASME Boiler and Pressure Vessel Code. The fuel pool cooling systems for for SFP A, B, C, and D are classified as ASME Code Section III, Division 1, Class 3 systems. The applicable edition of the ASME code is Section III, 1974, Winter 1976 Addenda.

Subsection NA of Section III addresses "General Requirements"; Subsection ND addresses requirements for "Class 3 Components". Subsection NA-8420, "Report Form for Field Installation," required that installation welds be verified on Data Form N-5, which includes attestation of the quality of the weld process and specification data for the weld filler material. The weld process was witnessed at several specified check points by a Quality Assurance inspector; the Authorized Nuclear Inspector had the option to witness any check point and verified the completed weld data report prior to closure.

The licensee's amendment request, submitted by letter dated December 23, 1998, states that certain records, notably piping isometric packages for field installation of the completion portion of SFP C and D, were inadvertently discarded. Subsection NA-8416, "Piping Systems" of the Code requires completion of N-5 forms for each piping system, which includes weld data records attesting to the quality of the weld process and weld material certification. Because these records have been lost, the SPF C and D cannot be certified as an N-stamp system.

Since piping welds for SFP A and B were completed during the same time frame as those for SFP C and D, and by the same group of welders, it is reasonable to expect similar quality of the N-5 data packages for both units. Therefore, the N-5 package for Pools A and B were examined. The N-5 forms were included as part of the N-3 package, which was submitted upon completion of Unit 1 to the ASME National Board, the enforcement authority having jurisdiction. The N-3 form listed the components including interconnecting welds and the data reports for a facility. The summary N-3 package for Unit 1 was examined by the inspectors.

Subsection NA-8400 identifies the reporting requirements for various components, including valves and pumps, parts and appurtenances, pipe subassemblies, and piping systems. Only the reporting requirements for 49 field welds cannot be met. The inspectors randomly selected data packages for two C and D SFP components: a pump (2B-SB) and a strainer (3-SF-53-5A-2). The data package for the pump included a Certificate of Compliance, a Manufacturer's Data Report (NPV-1), material certification, hydrostatic test reports, performance test reports, welding ticket records, dimensional inspection records, a cross-sectional drawing, and an as-built drawing. The data package for the strainer included an ASME Code data report, a Certificate of

Conformance, liquid penetrate reports, a product quality control check list, material test reports, an inspection and test report, dimensional inspection records, and sequence traveler.

Conclusions

The ASME N-3 and N-5 data packages for Unit 1 and the ASME data packages for two SPF C and D components reviewed by the inspectors were determined to be complete and satisfactory and provided an indication that the licensee documented construction of the SFP in accordance with ASME requirements.

## 2.4 Review of Audits of ASME QA Program Implementation

Inspection Scope

The inspectors randomly selected an audit of ASME QA program implementation for review.

Observations and Findings

CP&L corporate audits were conducted of the ASME QA Program implemented at Shearon Harris. The inspectors retrieved a listing of these audits from the licensee's data base and noted that eight such audits had been conducted during the period from March 19, 1979 through February 19, 1982. From these audits, the inspectors randomly selected audit QAA/170-6 for review. QAA/170-6 was conducted at the Shearon Harris site on September 21-29, 1981. The inspectors reviewed the audit checklist, the audit report containing the findings and concerns, the memoranda describing the corrective actions for each identified deficiency, and the QA closure documentation. The audit report concluded that the Shearon Harris Construction, Nuclear Plant Engineering, and QA Program adequately met ASME code requirements except for eleven findings and sixteen concerns. The identified deficiencies were typically associated with procedural and training requirements and indicative of careful review by the auditors. The inspectors reviewed the corrective actions and found them reasonable and appropriate. All corrective actions were implemented and determined to be satisfactory by the licensee'sQuality Assurance organization within four months following the audit.

Conclusions

The audit report showed that the licensee's QA program implemented the ASME program and NRC requirements during construction.

## 2.5 Review of Vendor ASME QA Program Implementation

Inspection Scope

The inspectors reviewed an audit of a vendor supplying Code equipment for compliance with ASME requirements.

Observations and Findings

The inspectors reviewed CP&L corporate audit QAA/702-1, conducted at the fabrication facility of Southwest Fabricating & Welding Company, Inc., a supplier of piping spool pieces for the four spent fuel pools at Shearon Harris. The audit was conducted on May 22-23, 1974, in order to appraise the the manufacturing facility and quality assurance program to adherence to purchase order requirements, including applicable Articles of Section III of the ASME Boiler and Pressure Vessel Code and the requirements of 10 CFR 50, Appendix B, "Quality Assurance for Nuclear Power Plants." The audit report concluded that the vendor's quality system, as defined in its QA Manual was adequate to meet the intent of the requirements imposed by the purchase order. The audit report identified six findings requiring corrective action. The inspectors reviewed the audit checklist and the audit report containing the findings. The inspector also reviewed the corrective actions taken by the vendor and the QA closure documentation. Based on this review, the inspectors determined that the deficiencies were relatively minor and administrative in nature and that the corrective actions were appropriate. All actions were determined to be satisfactory by the CP&L Quality Assurance organization within three months of the audit with exception of an issue related to training and qualification of audit personnel. This issue was held open pending resolution of a related draft ANSI standard and closed satisfactorily in December, 1974.

Conclusions

The vendor audit report showed that the licensee's QA program implemented the ASME program and NRC requirements for performance of vendors during construction.

## 2.6 Review of QA/QC Related Reports

Inspection Scope

The inspectors reviewed a random sample of QA/QC related reports to assess the effectiveness of the site QA/QC program in identifying and resolving problems associated with SFP welding activities.

Observations and Findings

Reports documenting results of QA/QC activities were reviewed by the inspectors to assess the effectiveness of the QA/QC program. The reports selected for review covered the period when welding activities were in progress on the piping from 1979 to 1982. The records reviewed include Deficiency and Disposition Reports (DDRs), Nonconformance Reports (NCRs), and QA/QC monitoring and surveillance reports. DDRs for ASME Code components required the ANI to review, approve and sign the final disposition as acceptable. The following DDRs, which are listed in general categories assigned by the inspectors, were reviewed:

| Category | DDR |
|---|---|

| | |
|---|---|
| Arc Strike | 869, 877, 895, 945 |
| Stamping | 888, 889, 914, 945 |
| Holdpoint | 829, 1009 |
| Hydrostatic Test | 783, 794 |

The identified deficiencies were clearly identified on the DDR and disposition of the deficiencies were appropriate. Concurrence with the disposition by the ANI and report closure by Quality Assurance was completed for all DDRs reviewed.

Nonconformances (NCRs) were less significant infractions of the QA program requirements (i.e., were less serious than DDRs). The following NCRs were reviewed and listed in general categories assigned by the inspectors.

| Category | NCR |
|---|---|
| Arc Strike | WP-206 |
| Stamping | W-027, W-096, W-103 |
| Holdpoint | W-207 |
| Welder Requirement | WP-111, W-028 |
| Weld Status Report | WP-278 |

Documentation of the nonconforming condition was clear and corrective actions were appropriate. The final disposition for each NCR was verified by the responsible QA Specialist.

For completeness of review, the inspectors arbitrarily selected a sample of QA/QC reports which documented monitoring and surveillance of weld activities. These covered areas which included material control, welding equipment, welder training and qualification, review of WDRs for accuracy and completeness, and compliance with weld procedures. The following QA/QC activity reports were reviewed and determined to be typical and expected for oversight of welding activities.

> WP62, WS79, WP56, W29, W86, W116, W124, W143, W199, W200, W285, W297, W322, W361, W365, W402, W429, W434, W456, W461, W462, W469, W475, QA8, QA81, WS80, QA146, QA150, QA169, QA215, QA294, QA359, QA424, QA368, QA376, QA509, QA548, QASRC83116, QA550, QA551, QA586, QA587, QA588, QA703, QA777, W509, W507, W506, W503, W767, W756, W750, QA16, QA254, QASRC187, QASRC822660, QA199, W630, W560, W554, W544, W519, W518, QA385, W8257, W225.

## Conclusions

Based on review of the above DDRs, NCRs, and reports documenting QC/QA activities, the inspectors concluded that inspection personnel actively monitored welding activities and processes for compliance with ASME Code and QA Program requirements. Deficiencies were accurately reported, corrective actions promptly taken, and appropriately resolved. All

corrective action documents reviewed were in compliance with the licensee's QA program and NRC requirements.

## 3. SFP C AND D DESIGN CHANGES

Inspection Scope

The inspectors reviewed the design changes prepared by licensee engineers to complete the C and D spent fuel pools.

Observations and Findings

The licensee implements design changes in accordance with CP&L procedure EGR-NGGC-0005, Engineering Service Requests (ESR). This procedure implements the design control program required by 10 CFR 50, Appendix B. The licensee prepared the following ESRs to complete the C and D spent fuel pools:

- ESR 95-00425, Study Effort to Support Fuel Pool in Service Date.

- ESR 99-00218, CCW Tie In to Heat Exchangers for North Pools

The inspectors reviewed the ESRs. ESR 99-00218 was prepared for connecting the C and D spent fuel pool heat exchangers to the Unit 1 component cooling water system. During the inspection, the licensee was in the process of installing piping and pipe supports required for the tie-in of the CCW system to the SFP C and D heat exchangers. The final tie in will not be completed unless NRC approval is received for the fuel pool expansion. ESR 95-00425 was prepared to complete the C and D SFP piping, complete installation of equipment (pump motors, strainers, etc.), perform system pre-operational and startup testing, and revise existing plant procedures to incorporate the C and D SFP into the Unit 1 operating plant.

The inspectors reviewed the 10 CFR 50.59 safety evaluation, design inputs, design evaluations, assumptions, and references, design verification documentation, and installation drawings and instructions. The inspectors noted that the details for commissioning of the existing equipment were incomplete. The licensee initiated ESR 99-00416 to control the commissioning process. This is discussed in the Section below. The requirements and procedures for preoperational and startup testing were also incomplete. Discussions with licensee engineers disclosed that these procedures will be developed following those used for startup of Unit 1 (SFP A and B). The 10 CFR 50.59 evaluation concluded that this project involved an unreviewed safety question which required NRC approval prior to completion and startup.

Conclusions

The ESRs were technically adequate and generally met regulatory requirements.

## 4. EQUIPMENT COMMISSIONING

Inspection Scope

The inspectors examined the licensee's maintenance and lay-up actions for the installed Fuel Pool "C" and "D" piping and equipment. In addition, plans for additional activities to ensure that equipment will meet all applicable requirements and be capable of performing its intended function were reviewed.

Observations and Findings

A significant portion of the Fuel Pool Cooling System and Component Cooling Water System piping and components for Fuel Pools "C" and "D" were installed during original construction in the late 1970s and early 1980s. As documented in section 26.5.0 of Engineering Service Request (ESR) Design Specification 95-00425, Revision 0, the equipment was never incorporated into the operating unit and has not been formally maintained under controlled storage since that time. The equipment was procured and installed to applicable quality assurance requirements. However, since the installed equipment has been stored in-place without a formal storage and lay-up program, the licensee plans to implement an equipment commissioning or dedication process to ensure that the equipment will meet the applicable requirements and is capable of performing its intended function in the completed design. In accordance with ESR 95-00425, which had not been approved and issued at the time of the inspection, a Matrix of Commissioning Requirements is to be developed, which will define the requirements, including any additional inspections and testing, for each component. At the time of the inspection, a preliminary matrix had been developed as part of ESR 95-00425 and ESR 99-00416 had been initiated to further detail and manage the commissioning process. Although plans and some of the details for the process were included in ESR 95-00425, most of the details for each individual component were still being developed to be included in ESR 99-00416. Based on discussions with responsible licensee personnel and review of ESR 95-00425, the commissioning process will consist of the following activities:

Scope Development

To develop the scope for the commissioning process, a field walkdown of the installed equipment (mechanical, civil, instrumentation and control, and electrical) will be performed to compare the installed equipment with the completed modification design and each item in scope will be identified and individually dispositioned as part of ESR 99-00416.

Document Review

Quality documentation will be retrieved and reviewed to ensure that required quality assurance information is available, complete and acceptable. The verified records will include original procurement and field installation records. The equipment installation records will be compared with field conditions to ensure that the installation as accepted has not been altered. If records are missing or deficient, an assessment will be performed to determine what can be accepted by virtue of retest or re-inspection, or by use of alternate methods of verification.

Test and Acceptance Criteria

The Equipment Commissioning Matrix will specify additional activities needed to ensure the required level of quality assurance because of the lack of formal storage and lay-up program since original equipment installation. These activities will include:

> Field verification of equipment identification against procurement documentation with establishment of traceability to Code Data Reports for code related equipment.
>
> Physical inspections and testing as required to verify that lack of controlled storage conditions and regular maintenance has not caused any condition (corrosion, aging, etc.) adverse to quality.
>
> Physical inspections and considerations necessary to ensure that plant activities since construction have not resulted in any conditions adverse to quality (scavenging of parts, introduction of foreign material, damage from personnel and equipment traffic, etc.).

Although the equipment commissioning details for individual equipment had not been finalized, some work had already been accomplished. The inspectors reviewed the following work requests (WRs) that had been issued:

> WR 98-AGAR1 - Disassemble and Inspect Valve 1CC-512
> WR 98-AFJA1 - Inspect Train A Spent Fuel Cooling Heat Exchanger
> WR 98-AFJE1 - Inspect Train B Spent Fuel Cooling Heat Exchanger
> WR 98-AFJF1- Disassemble and Inspect Train A Spent Fuel Cooling System Strainer
> WR 98-AFJH1- Disassemble and Inspect Train B Spent Fuel Cooling System Strainer
> WR 98-AFIY1- Disassemble and Inspect Spent Fuel Pool Cooling Pump 2A
> WR 98-AFIZ1- Disassemble and Inspect Spent Fuel Pool Cooling Pump 2B

Disassembly and inspection had been completed for WRs 98-AGAR1, 98-AFJA1, 98-AFJE1, 98-AFJH1. The other 3 WRs had not yet been worked. For inspection of the Heat Exchangers, the WRs only covered removing the end covers and inspecting the tube side of the Heat Exchangers. The WRs indicated that a nitrogen purge had been maintained on the shell side of the heat exchangers. However, further investigation revealed that the use of the nitrogen purge had not been implemented until late 1991. In May of 1988, WRs 88-AMYH1 (Train A) and 88-AMYI1 (Train B) were issued to provide a nitrogen purge on the shell side of the Heat Exchangers. The WRs documented that the shell side of the Heat Exchangers had been open to the Fuel Building atmosphere. There was no indication how long the heat exchangers had been open. The 1988 WRs installing the purge were not worked until December 1991. Also, additional WRs documented a number of problems with low nitrogen purge on Train B Heat Exchanger in 1993. Based on the documented history of lack of control of the atmosphere on the shell side of the Heat Exchangers, the inspectors questioned whether additional

evaluations of the Heat Exchangers were needed. In response, the licensee indicated that further evaluations of the shell side of the Heat Exchangers will be performed as part of the commissioning process under ESR 99-00416.

The inspectors walked down and observed the general condition of the installed piping and equipment. Even though the equipment had not been maintained under a formal program, the equipment and piping appeared to be well preserved. The inspectors also examined spent fuel pool cooling pump motors "A" and "B", which have been stored and maintained in the warehouse since procurement at the time of construction. These were found to be in good condition with the motor space heaters energized. Evidence of control of storage of the pumps, including records of periodic pump shaft rotation, maintenance of heat on motors, and megger testing, were reviewed. Preventative maintenance of these parameters had been maintained in accordance with licensee Material Evaluation Procedure ME 000261.03.

The inspectors inspected three welds, weld numbers 2-CC-3-FW-207, 2-CC-3-FW-208, and 2-CC-3-FW-209 for misalignment and concluded that there was no noticeable misalignment.

The inspectors reviewed the re-inspection records for installed welds and piping as discussed below.

Based on the above reviews, the inspectors concluded that the planned equipment commissioning process should ensure that existing equipment will meet requirements and will perform its design function. However, since the details of tests and inspections to be performed for individual equipment items had not been completed, Inspector Followup Item (IFI) 50-400/99-12-01, Review of Final Equipment Commissioning Details, was opened to track further inspection after more details are available.

Conclusions

Although details of the commissioning inspections had not been finalized for each individual piece of equipment, a detailed plan had been drafted and if properly implemented should ensure that existing equipment meets requirements and will perform its intended function. An IFI was opened to track further inspection of the equipment commissioning process after more details of the tests and inspections to be performed for individual equipment items are available. The equipment commissioning WRs reviewed were considered appropriate to ensure that equipment is acceptable to place in service. Based on the documented history of lack of control of the atmosphere on the shell side of the Spent Fuel Pool Cooling Heat Exchangers, the inspectors concluded that additional evaluations of the heat exchangers were needed.

## 5. ALTERNATE INSPECTION PROGRAM

### 5.1 Review of Weld Records

Inspection Scope

The inspectors reviewed the Spent Fuel Cooling System and Component Cooling System weld and weld inspection records as detailed below.

Observations and Conclusions

The licensee re-inspected all existing accessible Fuel Pool "C" and "D" Spent Fuel Pool Cooling System (SFPCS) and supporting Component Cooling Water System (CCWS) pipe and pipe attachment field welds. The welds were visually (VT) and liquid penetrant (PT) inspected. In addition, vibro-tooled welder symbol identifications were taken from each weld surface and welder qualification verified by review of records. The re-inspections and the welder symbols were documented on new Weld Data Reports (WDRs). The inspectors reviewed the new WDRs, the NDE qualification records for the current re-inspections and the original construction welder qualification records for these welds. All records were retrievable and found to be in order.

In addition to review of the re-inspection records for the accessible welds, records consisting of WDRs, welder qualification records, weld QC inspector records, NDE examiner qualification records,, welding procedure specifications (WPSs), and procedure qualification records (PQRs) were reviewed for the below listed Unit 1 SFPCS piping welds. These Unit 1 (SFP A and B) welds were constructed using the same welding QC program at approximately the some time period as that used for the cooling system piping welds for Fuel Pools "C" and "D".

F1-236-1-SF-10-FW-60
F1-236-1-SF-2-FW-9
F1-236-1-SF-10-FW-58
F1-236-1-SF-2-FW-8
F1-236-1-SF-10-FW-59
F1-236-1-SF-2-FW-6
F1-236-1-SF-2-FW-7

These original Unit 1 (SFP A and B) construction records were retrievable, legible, and complete. The records provided objective evidence that a detailed welding quality control program was in place and followed during original construction.

Conclusions

All records reviewed were retrievable and in order. The original Unit 1 construction records provided good assurance that the SFP C and D welding was accomplished and documented in accordance with the approved welding quality assurance program in effect at that time.

## 5.2 Welding Material

Inspection Scope

The inspectors reviewed the welding procedure specifications and the records for the filler metal (materials) used for welding the SFPCS and CCWS piping.

Observations and Findings

SFP A & B Filler Metal

The inspectors randomly selected embedded SFPCS welds from isometrics drawings, 1-SF-2 and 1-SF-10 from SFP A and B for review. The WDRs for these welds were reviewed by the inspectors. From the WDRs, the inspectors randomly selected the certified material test reports (CMTRs) for filler and insert metals and reviewed the chemical test records. Based on the records reviewed, the inspectors concluded that the materials used for the embedded welds were type 308 filler metal, type 308 consumable inserts, and type 304 base material (piping materials).

The inspectors reviewed Weld Procedure Specification (WPS)1BA3 for the material used for welding the pipes in the component cooling water system. The WPS listed the pipe material as P-1, Grade 1 (Appendix D to Section XI of the ASME Code) and weld filler metals as E70S-6 and E7018. For procedure qualification, WPS 1BA3 referenced Procedure Qualification Report (PQR) 15. The inspectors reviewed PQR 15 and CMTRs of the material used for the qualifications.

Product Check Chemistries

The inspectors compared the chemistries from CMTRs with the stainless steel product check chemistries submitted to NRC in a letter dated April 30, 1999, Subject: Response to NRC Request for Additional Information Regarding The Alternative Plan for SFPCS Piping, and the chemical analyses from PQR 15 that were used for qualifying the carbon steel weld procedure specification 1BA3 with product check chemistries submitted to NRC in a letter dated June 14, 1999. The comparisons showed carbon analyses for the product checked consistently above the filler metal values for SFP A & B and values recorded in the PQR. The inspectors questioned the licensee regarding possible carbon contamination with the product check chemistries.

In search of the contamination, the inspectors examined the sampled surface on weld 2-CC-3-209. The sample had been removed from the center of the weld crown. The weld and surrounding pipe were clean and free of foreign matter. Next, the inspectors reviewed the technique used for sampling. The sampling technique is in Appendix A to Procedure NW-16, Revision 1, "Identification of Base Metals for Welding Applications," dated January 6, 1998. The sampling technique uses a rotary carbide deburring tool which removes material with a grinding action. Licensee engineers suspected that the deburring tool was a possible source of the carbon contamination. The licensee made test samples by taking known material and seeding it with metal flakes broken from the teeth of the deburring tool. The tests showed that for samples seeded with 5 and 10 weight percent from the deburring tool, the carbon analyses increased by .03 and .08 weigh percent, respectively. The tests showed that the carbide deburring tool was a possible source of carbon contamination.

Alloy Comparator

During the inspection, the inspectors witnessed a demonstration of the test method used to develop the acceptance criteria for the test data submitted to NRC in the April 30, 1999 letter. For the testing, the licensee utilized the Metorex X-Met 880 electronic unit, CP&L Control No. MLCE-132 which was operated by CP&L's plant metallurgist. The inspectors reviewed the following: Operating Instruction Manual 3881 432-4VE; and operating procedure: MCP-NGGC-0101, Revision 1, Test Method 4, dated March 26, 1999. For developing an acceptance criteria, the metallurgist setup the X-Met using the same calibration and reference standards that were used for the previous testing. For calibration, pure standards for Fe, Cr, Ni, Cu, Mo, and a backscatter sample were run and stored in the X-Met. For reference alloys, stainless steel standards for type 304, 309, 310, 316, and NIST C1154a were run and stored in the X-Met reference library.

For the development of the acceptance criteria, 12 different standards were used. Each standard was run 10 times producing an average set of chemical values. In the comparison mode, the X-Met compared each test against the standards stored in the reference library. If the test matched or was close to a match with a reference standard, the X-Met displayed the reference standard followed by the term: good, possible, or good/possible. If a test did not come close to any reference standard, the X-Met displayed "no good match." The reference standards, test standards, type of match displayed for that standard, and the Cr, Ni, Mo, Mn, and Cu from the certified analysis reports for the standards are shown in Table 1 in the Appendix. The data showed that the X-Met comparison mode can discriminate stainless steel types and chemical extremes within a stainless steel type. Based on the testing performed on the accessible field welds and Table 1, the licensee's metallurgist tentatively established the acceptance criteria for field welds as two test displays showing a good or possible match and no test displays showing no good match.

Conclusions

The SFPCS piping and CCW piping was welded using the correct materials. The X-Met and chemical analysis provided identification of stainless steel and carbon steel materials.

### 5.3 Water Quality

Inspection scope

The inspectors reviewed the C & D SFP pipe welds exposed internally to hydrostatic pressure test water and/or the spent fuel pool water.

Observations and Findings

The inspectors reviewed drawings and hydrostatic test records to identify the C & D SFP welds that were exposed internally to hydrostatic pressure test water or spent fuel pool water, to determine the length of time that these welds were exposed to that water. Of the 52 welds

identified in CP&L's letter dated April 30, 1999, pipe welds 2-SF-1-FW-3, 2-SF-1-FW-6, and 2-SF-36-FW-448 were replaced by new welds, and 12 are hanger-to-pipe welds. Of the remaining 37 pipe welds with missing documentation, the inspectors identified 15 welds exposed to hydrostatic test water, 22 welds exposed to the fuel pool liner leak test water, and the same 22 welds exposed to the current fuel pool water conditions.

Hydrostatic test water quality was specified in CP&L Procedure WP-115, Revision 0, "Hydrostatic Testing of Buried or Embedded Pressure Piping," dated September 19, 1979. WP-115 specified that potable or lake water was to be used for hydrostatic testing. After testing, the procedure required that the pipes must be drained. However, the procedure did not specify a time limit for draining of the piping/system. The inspectors were unable to determine from documentation when the piping was drained. However, logic dictates that the pipes were drained before the licensee performed the fuel pool liner leak testing (hydrostatic test).

Hydrostatic test water quality for fuel pool liners was identified in CP&L Procedure TP-57, "Hydrostatic Test of Fuel Pool Liners," dated May 17, 1983. TP-57 required that that the fuel pool be leak tested for a 24 hour period using unchlorinated site water. The procedure defined unchlorinated water as site water with a chloride content not exceeding 100 parts per million (ppm). After the test, the procedure required that the test water was pumped out of the SFP and that the pool was rinsed with demineralized or distilled water. Attachment A to TP-57 for SFP D showed that the pool was filled June 11, 1985 with water containing less than 1 ppm chlorides and that the rinse was completed on November 1, 1985. For SFP C, the records showed that the pool was filled May 7, 1985 with water containing less than 1.5 ppm chlorides and that the rinse was completed on November 4, 1985.

Discussions with licensee engineers disclosed that SFPs C & D were filled with SFP quality water around 1989 and have been full ever since. The gates between SPF A and B and C and D were opened at various times which resulted in the water mixing between the pools. During April 1999, the licensee obtained water samples from the low points in seven of eight pipe lines connected to SFP C & D. These samples were analyzed for impurities. The results are tabulated in Table 2 in the Appendix. The inspectors compared the sample results to the administrative limits for A & B SFP and data for a primary system cold shut down that is published in NUREG CR-5116, Survey of PWR Water Chemistry, February 1989. Based on the data reviewed, the water quality in SFP C & D was similar to the water quality in SFP A and B.

The pipe welds exposed to the potentially poorest water quality were the embedded welds. If corrosion or fouling were to occur, they would occur in the embedded welds first. The presence of corrosion or fouling would be visible from the interior of the piping. The visual inspection of the embedded welds performed by the licensee to examine the interior of the embedded piping is discussed below.

Conclusions

The pipe welds exposed to the potentially poorest water quality were the 15 embedded welds. The pipe welds remaining were exposed to treated water with very low impurities and similar to the water quality in SFP A and B. If corrosion or fouling were present in the SFP C and D piping, they would occur in the embedded welds first because of the type of water the embedded piping was exposed to.

### 5.4 Review of the Procedure for Remote Visual Inspection of Welds and Piping

Inspection Scope

The procedure used for remote visual inspection of embedded welds was examined for compliance with the CP&L Quality Assurance Program and NRC requirements.

Observations and Findings

The inspectors reviewed Temporary Procedure SPP-0312T, Temporary Procedure For Remote Visual Examination of Interior Welds and Surfaces of Embedded Unit 2 Spent Fuel Pool Cooling Piping for C and D Pools. The procedure provided instructions for performing remote visual examinations of interior welds and surfaces of embedded piping for the SFP C and D piping. The results of these examinations were used to determine whether the weld quality and interior surface conditions meet the acceptance criteria established in Paragraph 6.0 of the procedure. The acceptance criteria specified that welds were to be free of the following defects: cracks, lack of fusion, lack of penetration, oxidation ("sugaring"), undercut greater than 1/32 inch, reinforcement ("push through") exceeding 1/16 inch, concavity ("suck back") exceeding 1/32 inch, porosity greater than 1/16 inch, or inclusions. Any recordable indications of these defects were recorded on Attachment 1 of the procedure. Other indications such as arc strikes, foreign material, mishandling, pipe mismatch, pitting and microbiologically induced corrosion were also recorded on the attachment and were required to be evaluated by licensee engineers.

In addition to reviewing SPP-0312T, the following referenced documents were examined by the inspectors with respect to applicable requirements: (1) ASME Section III, 1974, Subsection ND-4424, Surfaces of Welds; NDEP-0606, Rev. 4, Remote Visual Examination; NDEP-601,Rev. 13, VT Visual Examination of Piping System and Component Welds at Nuclear Power Plants; and NDEP-A, Rev. 13, Nuclear NDE Procedures and Personnel Processes.

Both Revision 0 (approved 5/17/99) and Revision 1 (approved 9/9/99) of procedure SPP-0312T were reviewed. Revision 1 contained no change in the technical content or scope of work, but was made to reflect a new vendor and contract number. Based on review of the procedure and applicable references, the inspectors determined that the procedure prescribed prerequisites, precautions and limitations, and detail on special tools and equipment to adequately control the scope of the visual inspection activities. Technical, process-related, and administrative references were adequate and complete. The acceptance criteria were appropriately detailed such that conclusions as to the weld quality and interior surface conditions could be made by qualified inspection personnel. The remote inspection procedure was reviewed for adequacy prior to its use by a licensee NDE Level III inspector. The licensee's Level III NDE inspector was interviewed by the inspectors. The Level III certification records and training for this individual were also reviewed.

Conclusions

The procedure which specified the method for visual inspection of the embedded welds provided detailed instructions and acceptance criteria for inspecting and evaluating the embedded welds. The procedure complied with the licensee's QA program and NRC requirements.

**5.5 Remote Visual Examination**

Inspection Scope

The inspectors reviewed the videotape that recorded the remote visual examination and the analysis of the remote visual examination of embedded welds. The review included piping and other welds captured on videotape. The inspectors also reviewed the licensee's evaluations of the welds documented on Attachment 1 to SPP-0312T.

Observation and Findings

The licensee performed a remote enhanced visual examination of 15 embedded field welds from inside the stainless steel SFP C and D piping. Prior to performance of the remote video examinations of the embedded piping, three Level II NDE personnel were trained in the use of procedure SPP-0312T. These individuals demonstrated their proficiency with the use of this procedure to the ANI and the Level III NDE inspector. Attestations to the satisfactory completion of these activities were reviewed by the inspectors and determined to be satisfactory.

The visual examination was performed by sending a mobile video camera with focusing and magnifying capabilities through the piping to examine each embedded field weld. The video camera sent images of the weld to a television monitor and video recorder. The images on the monitor were viewed by the licensee's Level II qualified remote visual inspectors. The Level II's observations were documented on Attachment 1 to SPP-0312T, "Remote Visual Examination Data Sheets." Attachment 1 contained a check list for recordable condition of the weld. These recordable conditions are described in the acceptance criteria of SPP-0312T. Weld acceptability was determined by the qualified Level II visual examiner in accordance with the acceptance criteria specified in procedure SPP-0312T and approved by a qualified Level III NDE inspector and the ANI.

The inspectors reviewed eight videotapes recorded during the remote visual inspection and the completed SPP-0312T Attachment 1 for each embedded field weld. The videotapes reviewed were as follows: weld 2-SF-8-FW-65 prior to cleaning; the in-process cleaning of 2-SF-144-FW-516; and the 15 embedded field welds after cleaning. The videotapes also captured images of accessible welds 2-SF-150-412 and 2-SF-148-FW-382.

In the videotape made prior to cleaning, the inspectors observed laced material particles inside the pipes and on the field welds. These particles looked like a dusting of snow flakes. They were flat, very thin, interconnected, and conformed to the contour of the pipes, pipe seams, and field welds. The inspectors viewed the videotape showing removal of the particles from welds 2-

SF-144-FW-516. The particles were removed with a pressurized water flow directed toward the pipes, interior surfaces. When the particles were hit by the water stream, they were readily dispersed. After dispersing, the particles appeared to be suspended in the water.

Based on the videotapes of the cleaned field welds, the inspectors concurred with the observations of the licensee's NDE inspectors recorded on the Attachment 1 to SPP-0321T for each weld. The inspectors observed the images of vendor fabricated welds, pipe seam welds, and the piping itself as the video camera traveled to the different embedded field weld locations. These images showed no misalignment, unusual protrusions, blockages, or indentations in the pipe walls, pipe seams, vendor fabricated welds, and the two accessible field welds examined. In the videotapes made of the cleaned welds, the inspectors identified conditions in three welds that require further evaluations. These conditions were: (1) an insert segment with the letters 308L still visible on weld 2-SF-144-FW-516; (2) brown spots that were out of focus with the surface of the pipe on weld 2-SF-144-FW-517, and (3) heavy stains, oxides, and deposits on weld 2-SF-159-FW-519. Although not part of the weld inspection, the inspectors also observed and requested an evaluation of a condition adjacent to the longitudinal seam in the pipe just beyond weld 2-SF-144-FW-515. The condition appears to be a fine saw tooth line located parallel to the pipe seam and about half the seam thickness away. The length of the line was not determined. The licensee stated that they were evaluating these conditions which were identified on the SPP-0312T, Attachment 1.

The inspectors reviewed and found satisfactory work requests associated with preparation for remote video inspection, and the system closure following completion of the visual inspection. These were WR/JO 99-ADUN2, ADUP1, AEHH2, and AFEY1. Results of the visual examinations were recorded on a data sheet, marked as a QA Record, which was included in SSP-0312T as Attachment 1. The data sheet was reviewed by the inspectors and determined to provide adequate detail of the examination to determine whether the acceptance criteria had been met and to record any recordable conditions noted by the licensee's NDE inspector. Completed data sheets documenting examination of 15 interior welds and piping surfaces were examined and determined to contain sufficient detail as to the results of the inspection. The signature of the NDE Level II examiner on Attachment 1 was determined to be one of the three personnel who were trained and qualified in the use of this procedure.

The recordable conditions documented on the data sheet are required to be reviewed and approved by licensee engineers and subsequently be approved by an ANI. The licensee initiated ESR 99-00266 to evaluate the recordable conditions. The evaluations were being performed by an independent engineering consultant. At the time of the inspection, evaluation of the recordable conditions had not been completed.

The inspectors reviewed and discussed the videotape examination of weld 2-SF-144-FW-516 with a CP&L welding supervisor that worked as a welding engineer during the construction of the SFP. The videotape showed the section of a consumable insert in the weld with the lettering 308L still visible on the consumable insert. The welding supervisor stated that the type of consumable insert for this application is shaped like the cross section of an inverted mushroom. The stem of the insert forms the base of the joint between the pipes. The joint is hand welded using a gas shielded tungsten arc welding process. The process should consume the insert and adjacent pipe during the first weld pass. The supervisor stated that insufficient heat input may fuse the insert (mushroom) head to the weld puddle instead of melting the insert completely. After the first pass, subsequent passes were made with filler metal to form weld layers. The supervisor estimated that 5 layers of filler metal were necessary to weld 3/8-inch thick piping.

The inspectors requested that the licensee provide chemical analysis on the particulate that were dispersed during the pipe/weld cleaning process. This particulate appeared reddish brown in color, is easily disturbed, and is believed by the licensee to be the source of the pipe stain. The inspectors questioned the ANI regarding the particulate. The ANI stated that there he observed abundant amounts of reddish brown color on the video equipment, piping interior, and at the video equipment entry point during the inspection. The licensee radiologically analyzed by chemical elements the particulate in 1990 and again in 1996. They provided the analyses to the inspectors for review. The particulate is radioactive with the most abundant element by two orders of magnitude being iron, followed by one order of magnitude cobalt, and zero order of magnitude nickel.

Conclusions

The condition of the embedded welds and associated piping inside the C and D SFP piping are free of abnormal obstructions and deposits. However, the inspectors identified four conditions requiring further evaluations. The licensee is in the process of evaluating the data shown on SSP-312T, Attachment 1 that include these four conditions.

### 5.6 QA Programs for Special Inspections Associated with the Alternate Inspection Program

Inspection Scope

The inspectors reviewed the alternate inspection activities for compliance with quality assurance requirements.

Observations and Findings

Ongoing activities associated with the alternate inspection program for resolution of issues concerning activation of Pools "C" and "D" were reviewed. These activities include remote inspection of the inner surfaces and field welds for embedded piping, determination of water chemistry during the period of layup, and examination of weld material taken from accessible field welds.

Oversight and examination of the embedded piping was performed by qualified NDE Level II examiners, who demonstrated proficiency in the use of the procedure used for the inspection (SPP-0312T) to the satisfaction of a NDE Level III examiner. The demonstration was witnessed and an Authorized Nuclear Inspector concurred with the demonstration of this proficiency.

Water chemistry analysis was performed by the CP&L chemistry organization, in accordance with site and corporate quality assurance program requirements. Material analysis of the weld samples was performed by NSL Analytic Services, identified on the CP&L Approved Supplier List with Supplier Control No. 16; manual dated 6/30/99; reviewed by CP&L 11/4/99. The supplier was audited for compliance under the CP&L Commercial Grade Survey program on February 1-2, 1999.

Conclusions

Activities associated with special inspections related to activation of fuel pools C and D were performed in compliance with applicable quality assurance requirements.

## 6. AUTHORIZED NUCLEAR INSPECTOR

Inspection Scope

The inspectors interviewed the authorized nuclear inspector (ANI) to determine the involvement of the ANI with the WDR, hydrostatic tests, and remote visual examinations.

Observations and Findings

The inspectors interviewed the recently retired ANI (July 1, 1999) and current ANI. The retired ANI was involved in plant construction and reviewed WDRs during plant construction. The verification was performed in two stages. The first stage was the verification of field weld fabrication at randomly selected predetermined hold points and ASME Code required inspection points. When satisfied that ASME requirements were met, the ANI initialed the associated line entry on the WDR. The second stage was verification of the entire WDR. When satisfied that all the necessary entries for the specified field weld were complete, the ANI signed off the WDR.

When questioned by the Inspectors regarding the significance of the ANI signature on the hydrostatic test document, both ANIs stated that the signature meant that the hydrostatic test satisfied ASME Code requirements, and the signature on the hydrostatic test was independent of any ANI signatures on the WDRs.

The ANIs were questioned regarding the extent of their involvement with the remote visual examinations of the 15 embedded welds in the C & D SFPs. They stated they both observed the equipment demonstration and qualifications of the remote visual examiners. For the equipment demonstration, a video camera was mounted on a transporting device that moved through a mockup of the SFP piping. The mockup contained flaws similar to those described in the acceptance criteria of Procedure SSP-0312T. In the mockup demonstration, the video camera transmitted images to a television monitor as it was moved. By viewing the monitor, the licensee's remote visual examiner directed the equipment operator to the areas of interest. These images were analyzed by the examiner. The examiner had to determine if the images of interest were a flaw, the type of flaw, and the acceptability of the flaw. The successful detection of flaws in the mockup demonstrated the equipment and remote visual examiner's skills. Upon a successful demonstration, the remote visual examiner qualification was certified by the licensee and verified by the ANI. On June 30, 1999, both ANIs signed off on the qualifications of the three remote visual examiners.

The inspectors questioned the current ANI regarding his involvement with the reinspection of the accessible welds and remote video examination of the embedded welds. The ANI stated that he observed the reinspection of accessible welds, 2-SF-36-FW-450 and 2-SF-38-FW-451, and that he observed the remote video inspections of at least two of the embedded welds. The actual examinations of the other embedded welds were less extensively viewed. At the time of the inspection, the ANI was in the process of reviewing the videotapes and verifying the data recorded on the remote visual examination data sheets.

Conclusions

The ANIs performed an independent verification of ASME Code requirements on the WDR and hydrostatic test documentation. The verification is part of their duties that are required by the 1974 Edition (and later) of ANSI/ASME Code N626.0, "Qualifications and Duties for Authorized Nuclear Inspection," and the referenced edition and addenda of Section III of the ASME Code. The ANIs were actively involved with the demonstration of the remote visual examination equipment and the qualification of the personnel. The current ANI was actively involved with examination and videotaping of the embedded welds

## 7. NRC INSPECTIONS DURING THE CONSTRUCTION PHASE

The inspectors reviewed NRC Inspection Reports which documented inspection of construction activities by NRC Region II Inspectors between 1978 and 1983. This was the period when the A, B, C, and D spent fuel pools were under construction. The inspection reports document more than 50 separate inspections for this period for items related to the welding program and/or piping installation. The majority of these inspections were performed by eight Region II Welding Specialist inspectors. Several violations dealing with the general subject of welding were identified in these reports. Most of these violations were relatively minor (Severity Level V and VI) and would not be cited under the current NRC reactor inspection program. These violations would typically be resolved through the licensee's corrective action program. The violations were typical of what one would expect for oversight of a large construction project and are not indicative of any programmatic weakness in the licensee's welding program.

## MANAGEMENT MEETINGS

The Team Leader discussed the progress of the inspection with licensee representatives on a daily basis and presented the results to members of licensee management and staff at the conclusion of the inspection on November 19, 1999. The licensee acknowledged the findings presented.

## PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Alexander, Manager, Regulatory Affairs
B. Altman, Manager, Major Projects Section
E. Black, Level III NDE Examiner

G. Brovette, ANI
B. Clark, General Manager, Harris Plant
E. Dayton, ANI (Retired)
J. Eads, Supervisor, Licensing and Regulatory Programs
S. Edwards, SFP Activation Project Manager
G. Kline, Manager, Harris Engineering Support Services
J. Scarola, Vice President, Harris Plant
K. Shaw, Licensing Engineer, Major Projects Section
M. Wallace, Senior Analyst, Licensing
Daniel W. Brinkey III, CP&L Metallurgist
Charlie Griffith, CP&L Welding Supervisor

Other licensee employees contacted included engineering, maintenance and administrative personnel.

NRC:

R. Hagar, Resident Inspector
K. Landis, Chief, Engineering Branch, Division of Reactor Safety

## INSPECTION PROCEDURE USED

TI 2515/143, Shearon Harris Spent Fuel Pool ("C" and "D") Expansion

## ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|---|---|---|
| 50-400/99-12-01 | IFI | Review of Final Equipment Commissioning Details |

Closed

None

Discussed

None

## APPENDIX 1

## TABLES

### Table 1

X-Met 880 Alloy Analyzer Data for Developing an Acceptance Criteria

| Standard | Cr | Ni | Mo | Mn | Cu | Good/Possible Match: Alloy | No Good Match | Overall Rating |
|---|---|---|---|---|---|---|---|---|
| Type 304 | 18.28 | 8.13 | 0.17 | 1.48 | 0.19 | 7 / 3: Type304 | - - - - | Good |
| Type 309 | 22.60 | 13.81 | - - - | 1.63 | - - - | 9 / 1: Type309 | - - - - | Good |
| Type310 | 24.87 | 19.72 | 0.16 | 1.94 | 0.11 | 5 / 5: Type310 | - - - - | Good |
| Type 316 | 16.74 | 10.07 | 2.06 | 1.44 | 0.11 | Not Analyzed | - - - - | - - - - |
| NIST C1154a | 19.31 | 13.08 | 0.068 | 1.44 | 0.44 | 10 / 0: C1154a | - - - - | Good |
| Standards Used to Check the Alloy Analyzer | | | | | | | | |
| NIST 1267 | 24.14 | 0.29 | - - - | 0.315 | - - - | 0 / 0 | 10 | No Match |
| NBS 1219 | 15.64 | 2.16 | 0.164 | 0.42 | 0.162 | 0 / 0 | 10 | No Match |
| NBS C1289 | 12.12 | 4.13 | 0.82 | 0.35 | 0.205 | 0 / 0 | 10 | No Match |
| BCS 331 | 15.20 | 6.26 | - - - | 0.78 | - - - | 0 / 0 | 10 | No Match |
| NIST C1151a | 22.59 | 7.25 | 0.79 | 2.37 | 0.385 | 0 / 0 | 10 | No Match |
| NIST C1153a | 16.70 | 8.76 | 0.24 | 0.544 | 0.226 | 0 / 9: Type304 | 1 | Possible |
| NIST C1152a | 17.76 | 10.86 | 0.44 | 0.95 | 0.097 | 0 / 4: Type304 | 6 | No Match |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NIST 1155 | 18.45 | 12.18 | 2.38 | 1.63 | 0.169 | 0 / 8: Type316 | 2 | Possible |
| NIST C1287 | 23.98 | 21.16 | 0.46 | 1.66 | 0.58 | 0 / 8: Type310 | 2 | Possible |
| NBS 1230 | 14.80 | 24.20 | 1.18 | 0.64 | 0.14 | 0 / 0 | 10 | No Match |
| NBS C1288 | 19.55 | 29.30 | 2.83 | 0.83 | 3.72 | 0 / 0 | 10 | No Match |
| NBS 1246 | 20.10 | 30.80 | 0.36 | 0.91 | 0.49 | 0 / 0 | 10 | No Match |

Table 2

Current Water Assay for C & D SFP Piping Systems, Administrative limits for A & B SFP, and NUREG CR-5116 Data for Primary Water in Cold Shut Down (ppb = parts per billion)

| Identification | F (ppb) | Cl (ppb) | $SO_4$ (ppb) | pH |
|---|---|---|---|---|
| 2-SF-75 | 57 | 29.5 | 1027 | 6.33 |
| 2-SF-74 | 29.3 | 62.7 | 682 | 5.82 |
| 2-SF-49 | 166 | 48 | 632 | 5.60 |
| 2-SF-215 | 11.7 | 26 | 321 | 5.55 |
| 2-SF-214 | 14.2 | 31.5 | 430 | 5.40 |
| 2-SF-212 | 120 | 70.5 | 676 | 6.74 |
| 2-SF-213 | 13.1 | 28.2 | 424 | 5.33 |
| A & B SFP Admin. Limits (1) | <150 | <150 | ---- | ---- |
| Primary Water(2) Shut Down | <150 | <150 | ---- | ---- |

(1) HNP Plant operating manual, Volume 5, Part 3, "SHNPP Environmental and Chemistry Sampling and Analysis Program," January 20, 1999.
(2) Shut down values above those indicated should be corrected before reaching full power operations.