UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-325/90-33 and 50-324/90-33

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket Nos.: 50-325 and 50-324 License Nos.: DPR-71 and DPR-62

Facility Name: Brunswick 1 and 2

Inspection Conducted: August 13-17, 1990

Inspectors: C. Smith 9-13-90
C. Smith Date Signed

R. Moore for C. Smith 9-13-90
R. Moore Date Signed

Accompanying Personnel: F. Jape on August 16 and 17, 1990

Approved by: Frank Jape 9/12/90
F. Jape, Section Chief Date Signed
Quality Performance Section
Operations Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of design, design change and plant modifications. This inspection reviewed licensee actions to resolve previously identified weaknesses in corporate and onsite engineering technical support.

Results:

In the areas inspected, violations or deviations were not identified.

The licensee has initiated actions to improve performance of both the Nuclear Engineering Design (corporate) organization and the Technical Support (onsite) organization. These actions strengthened NED programs and demonstrated a positive improvement trend. Technical Support activities were generally adequate and well documented. Although System Engineering weaknesses have been addressed by the licensee, training and personnel turnover rate continue to be program aspects that require further improvement.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*K. Altman, Manager, Regulatory Compliance
*C. Blackmon, Manager, Operations
G. Burns, Operations Technical Support
*A. Cheatham, Manager, E&RC
*K. Core, Control and Administration
*T. Cosmatin, QA/QC
*W. Dorman, Manager, QA/QC
*M. Foss, Regulatory Compliance
*J. Harness, General Manager
*R. Helme, Manager, Technical Support
*J. Holder, Manager, Outage Management and Modifications
*L. Jones, Control and Administration
*T. Jones, Sr. Spec.-Invest, Regulatory Compliance
*J. Leviner, Manager, Engineering Projects, Technical Support
*D. Moore, Engineering
*J. Moyer, Tech. Asst. to Plant General Manager
P. Musser, Manager, Maintenance Staff
C. Schachte, Supervisor, Cooling Systems Engineering
*R. Warden, Manager, Maintenance
*K. Williamson, Manager, NED Brunswick Site Organization
*E. Wilson, Manager, Nuclear System Engineer, Technical Support
M. Worth, Manager, BOP Systems Engineering
*L. Wright, QA/QC

Other licensee employees contacted during this inspection included engineers, operators, and administrative personnel.

NRC Resident Inspectors

*R. Prevatte, Senior Resident Inspector

*Attended exit interview

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. Followup of Weaknesses Discussed in Brunswick SALP Report 50-325,324/89-28

The NRC Systematic Assessment of Licensee Performance (SALP) report, 50-325/89-26 and 50-324/89-28, identified several deficiencies related to development and implementation of the licensee's design-engineering program. These are summarized below:

- The program for design change development was inadequate due to a weak design base information resource.
- Design interfaces were inadequately defined.
- Program procedures were not updated to correctly reference defunct and existing design groups and their responsibilities.
- Unavailability of pre-operational test data.
- Untimely administrative closeout of plant modifications.
- Applicability screenings of design changes for 10 CFR 50.59 evaluations did not consistently identify if modified plant systems/components were addressed in the FSAR.

The inspector examined the corrective actions the licensee has developed and implemented to correct the above Engineering and Technical Support SALP deficiencies.

a. Design Basis Information Resource

Corrective actions developed and implemented for this deficiency are delineated in NED procedure number 3.1.A, Design Basis Document, Revision 27. This procedure specifies requirements for the preparation, review, and approval of modification design basis documents. It mandates the use of design basis documents for all projects involving modification to CP&L nuclear plants. Additionally, it establishes requirements for using previously prepared design basis documents in lieu of creating a new one. Pursuant to review of the procedure, the inspector determined that technical guidance for preparing Design Basis Documents is contained in Attachments A and B of NED 3.1.A. The inspector concluded that adequate controls have been established to ensure that bases for plant modifications are identified, documented, reviewed, and approved in accordance with the requirements of ANSI N45.2.11,- 1974, Paragraph 3.0.

b. Design Interface Definition

Corrective actions developed and implemented for this deficiency are delineated in NED procedure number 3.7, Preparation and Control of Interface Documents, Revision 27. The inspector verified that requirements have been established for determining when an interface document is required. Assignment of responsibilities for making this determination and guidance for preparing and controlling interface documents were also verified as having been established.

The design controls specified in NED procedure 3.7 are implemented by procedure BNP-1A-001, Interface Document for NED and BNP, Revision 1. This procedure defined the interfaces and responsibilities of the NED

and BNP and implemented design controls in accordance with the requirements of ANSI N45.2.11-1974, Paragraph 5.0. The inspector determined that procedure BNP-1A-001 does not accurately describe the responsibility assignment related to design-engineering procurement actions. With establishment of the Procurement Engineering group on site, these responsibilities were delegated to this organization via a MOU. Procedure BNP-1A-001 needs to be revised to reflect this assignment and is scheduled to be revised by the licensee on October 29, 1990.

The inspector concluded that requirements for implementing design interface controls have been established by the licensee. Responsibilities have been assigned and necessary guidance concerning preparation and control of design interfaces have been proceduralized. However, until CP&L management revises procedure BNP-1A-001, implementation of these controls are not consistent with actual practice.

c. Outdated Program Procedures

Continued implementation of the IAP has resulted in some organizational changes. Because of this, there have been changes in functional responsibilities, levels of authority, and lines of internal and external communication interfaces for these organizations. An indepth evaluation of the licensee's program documents was not performed. However, based on the results of the DET follow-up inspections, appropriate corrective actions have been implemented to address this deficiency. Specifically, changes in the NED organization structure with creation of the NED Brunswick site organization has resulted in a need to revise NED guideline No. A-29, NED Unit Functions, Revision 2. This procedure is scheduled for change by September 28, 1990.

d. Unavailability of Pre-operational Test Data

An indepth evaluation of unavailability of pre-operational test data was not performed. To the extent deemed necessary by the inspector, this subject was discussed with cognizant engineers during (1) independent design reviews of plant modification packages and (2) evaluation of design bases information source.

An inspection of this functional area will be performed during reviews and assessment of licensee's DRD activities.

e. Untimely Administrative Close-out of Plant Modifications

Discussions with licensee management revealed that a system has been established at Brunswick to ensure plant modifications are budgeted and closed out. Administrative controls related to the closeout of plant modifications are specified in procedure NPMP, paragraph 6.0,

Revision 3. Close-out of modification packages, after the modified system/component has been declared operable, includes (1) clearing outstanding exceptions to the modification packages and/or (2) revising design output documents or procedures to document, justify, or reflect the as-built condition. Licensee management presented the following objective evidence in support of their actions taken to address this SALP deficiency.

CP&L memorandum from B. J. Phelps, subject: Log of Open Plant Modifications, dated August 2, 1990

CP&L memorandum from B. J. Phelps, subject: Log of Closed Plant Modifications, dated August 2, 1990

CP&L memorandum from B. J. Phelps, subject: Plant Modification Milestones, dated August 2, 1990

Licensee management was unable to provide the inspector specific information concerning the monthly work off rate for closure of plant modifications. Data was provided which showed the total plant modifications ready for closeout per month, plus the total plant modifications closed out per year. Review of these data revealed a reduction in the number of plant modifications ready for close-out on a monthly basis, and an increase in the annual close-out rate from 1986 through 1989.

Review of trend charts revealed some improvement concerning close-out of packages defined as mod operable close-out incomplete. A sustained level of effort relative to the preparation of packages defined as mods ready for final review was also indicated; albeit a monthly rate of only 2[illegible] packages was demonstrated. The trend charts covered the period April through August 1990.

The inspector concluded that CP&L management has taken corrective actions to address this SALP deficiency. Additionally, some progress has been made as demonstrated by the data presented by the licensee. Information concerning the monthly workoff rate for closing plant modifications relative to the total number of installed modification packages that were declared operable was not available. An evaluation of licensee's progress in reducing the number of these open modification packages could not be made.

3. Design, Design Changes and Modifications (37700)

a. Plant Modification 88-010, D/G Supply Fan Auto Actuation

Supplemental LER No. 1-88-008, dated July 27, 1988, documents the mechanical failure of D/G building C supply fan. The licensee completed a fluorescent liquid penetrant test of the fan blades and determined that a generic failure mechanism existed involving failure

of the A supply fan in December 1987; failure of the C supply fan; and linear indications on the B fan blades. The root cause of the failure was identified as mechanical stressing of the fan blade material caused by excessive start/stop cycling of the fans.

Plant modification 88-010 was developed to correct the design deficiency described in the above LER supplement. The scope of the plant modification were as follows:

- Correcting numerous discrepancies between existing plant drawings and as-built field conditions, primarily wire number changes.

- Replacing existing temperature switches with four new ASCO temperature switches having a larger adjustable dead band.

- Enabling the "Auto 2" function of the control circuit by adding four new Westinghouse relays and implementing logic changes using temperature switches above.

The inspector reviewed selected portions of the plant modification and verified that a nuclear safety evaluation had been performed in accordance with the requirements of 10 CFR 50.59. The safety evaluation clearly delineated the determinations arrived at. It also identified those sections of the FSAR and TS researched to arrive at the documented conclusions. Review of section B of the modification package verified completion of the design basis document. The scope of the design change and industry codes and standards specified in this section were discussed with the responsible engineer. The inspector concluded that applicable technical and quality requirements had been imposed on the plant modification.

The scope of the hardware changes and the basis for the new temperature switches setpoints were reviewed and discussed with the responsible engineer. A test scoping document, section E of the modification package, had been prepared to specify post-modification test requirements and test acceptance criteria. The inspector concluded that the design deficiency described in supplemental LER 1-88-008 was being adequately dispositioned by the licensee.

b. Plant Modification No. 89-103, SBGT/Secondary Containment Auto Initiation Logic Change

LER No. 89-018, dated September 15, 1989, documents an original design deficiency involving the secondary containment isolation dampers. The licensee discovered that the secondary containment isolation dampers exceeded the TS specified LCO time because of failure to recognize a design logic interface between the dampers and each unit SBGT train control logic. Investigations revealed that de-energizing one SBGT train starter circuit resulted in loss of

power to the related division secondary containment isolation logic relay A-CRMX or B-CRMX. This defeated automatic closure of the dampers in response to a drywell high press/reactor low level number 2 signal. Licensee management determined that de-energizing a SBGT train puts the unit in a seven day LCO. The related secondary containment division isolation dampers, however, only have an eight-hour LCO per TS section 3.6.5.2.

Plant modification number 89-103 was developed to correct the design deficiency described above for Unit 1. The scope of the plant modification involved removal of the "B" relay from both trains of the SBGT starter circuits and using the K82 and K66/K67 relays in series to provide a trip input to relays 3A-A or 3B-A. Normally closed auxiliary contacts from these relays are used to initiate automatic closure of the isolation dampers independent of the CRMX relays.

The inspector verified by review of selected portions of the modification package that (1) a safety evaluation had been performed and (2) a design basis document had been prepared in compliance with licensee program requirements. Additional reviews of design drawings and discussion with the cognizant design engineer and systems engineer was performed. This plant modification has been partially implemented for Unit 1 and will be completed during the next RFO. The scope of the field changes to be made includes removal of the CRMX relays which are still within the SBGT trains starter circuits. Additionally, Unit 1 drawings which were not revised at the time of the inspection, will be changed to show actual field installed conditions.

The inspector concluded that the original design deficiency described on LER No. 89-018 has been adequately dispositioned by the licensee.

d. Plant Modification No. 89-062, D.C. MCC Load Coordination (Unit 1)

Plant modification number 89-062 was developed to correct a design deficiency involving improperly sized thermal overload heaters for motor driven pumps fed from MCCS IXDA and IXDB. The overload relays do not perform a protective function. A trouble contact from an alarm relay, device 74, is used to initiate an alarm in the control room upon pump motor overload condition. Additionally, this alarm feature will only be implemented for the HPCI turbine hydraulic oil pump with provision for implementing this feature for the remaining pumps in the future. The scope of the plant modification also included replacing the existing overload relays with ambient compensated relays.

Review of the modification package, and discussions with the responsible design engineer, revealed the use of unapproved design input information concerning values of motors full-load and locked

rotor current. This data was obtained from calculation set BNP-E-6.003, which was unapproved by the project engineer. The responsible design engineer stated that values for motor currents contained in the above calculation were based on approved information obtained in the field. Omission of the principal engineer's signature while being less than adequate design control, does not invalidate the technical adequacy of the plant modification if the design inputs are based on motor nameplate data. It is the inspector's understanding that this is the case, and calculation ID BNP-E-6.063, used this information to provide a design basis for sizing the heaters. Additional reviews of selected parts of the plant modification package verified preparation of (1) a nuclear safety evaluation, (2) design basis document, and (3) post-modification test scoping document. The inspector did not identify any deficiencies during the above review.

4. Technical Support Organization

The licensee has established a well-defined Technical Support Organization. In September 1989, the onsite technical support resources were realigned under one organization. The staff size was approximately 108 including eight vacancies and one contractor. Technical Support engineering subunits include systems, maintenance support, components, ISI/IST, projects, and performance. Subunit responsibilities were generally stated in ENP-01, Technical Support Organization, Revision 5, and more specifically stated in the Technical Support Assignment List dated November 17, 1989. Technical support interface with the plant was generally accomplished via verbal communication, Technical Support Memoranda, Engineering Work Requests, Plant Incident Reports, and Engineering Evaluation Reports. Verbal communications were generally documented via TSMs. The following procedures provided adequate guidance for these activities:

ENP-20, Engineering Work Request, Revision 11
ENP-20.1, Technical Support Action Item Tracking, Revision 3
ENP-12.1, Use of Technical Support Memoranda, Revision 1
AI-65, Incident Reporting and Control, Revision 6
ENP-12, Engineering Evaluation Procedure, Revision 2b

The interface agreement between the Technical Support Organization and the Nuclear Engineering Department, BNP-1A-001, was reviewed by licensee QA audit QAA/0021-90-01. Deficiencies identified demonstrated the licensee was aware of the need to clearly designate engineering responsibilities between the two engineering organizations.

The Systems Engineering subunits provided a plant technical support resource. The system engineering concept at Brunswick Nuclear Plant is not a recent development. System engineers were assigned approximately four years ago and training requirements specified; however, the program was generally undefined and training not emphasized. Previous program

weaknesses identified by the NRC and the licensee include: excessive collateral duty load, lack of direction, inadequate training, and high turnover rate. Licensee actions in the previous 18 months demonstrate a commitment to improve the system engineering program. These actions include reduction in collateral workload, improved program definition and independent program assessments.

The System Engineer Basic Work Function and Performance Measures document provided designation of SE responsibilities. This document was specifically tailored to each SE. The supervisor to engineer ratio was approximately 1 to 6. Review of a sample of recent SE performance appraisals demonstrated the SEs were being evaluated against designated performance criteria. SE procurement responsibilities were deleted and technicians utilized to relieve the assigned administrative responsibilities. The licensee has demonstrated positive action and improvement in addressing SE weaknesses related to lack of direction and collateral duty load.

Although the licensee has initiated actions to address SE training deficiencies, the demonstrable results were limited. A training program was developed as documented in ENP-606, System Engineer Qualification, Revision 2. The qualification or certification activity primarily includes self-study related to specific assigned systems, practical factors such as system walkdowns and discussions of system operations with supervisory staff. Certification is achieved by successful completion of a plant cross-organizational oral board. No SEs have completed this certification process. Four of approximately 30 SEs were 75 percent complete; the majority were at less than 35 percent. Although training continues to be an area of weakness, a degree of progress was demonstrated by the establishment of training goals and monitoring of individual status with respect to these goals. It was notable that the SE certification process did not include general plant systems training. This was provided at BNP by a management and technical staff course. Less than 50 percent of the SEs have completed this general systems training.

Although SE program mission statements and discussions with staff demonstrated management's emphasis on training, the results previously discussed did not demonstrate the effectiveness of previous actions. Lack of incentives and time were contributors to limited success regarding training initiatives. SEs are presently assuming a full and challenging work load. There was no apparent change in performance level related to certification completion. There was no specific allotment of time for self-study or training activity.

An additional SE program weakness which has not been fully resolved was the staff turnover rate which impacts overall SE experience level. The turnover rate continues to be at 10 to 15 percent. The turnover rate increased during the phase-out of nuclear incentive pay over the past several years and has not decreased. The industry demand for experienced engineers is high, the job function is demanding, and it appears that BNP incentives are not presently competitive.

The impact on experience level in combination with the training weakness directly impacts SE performance capability.

Discussions with SEs demonstrated the individuals were knowledgeable of assigned systems, knowledgeable of their job functions, and enthusiastic. Five SEs were interviewed. SE activity was predominantly reactive characterized by routine interface with plant maintenance and operations staff. Although there were some examples of proactive activity, i.e., system trending, equipment availability study, etc., there was no established methodology.

An independent assessment of the BFN SE program was performed in July 1990. This assessment provided numerous improvement recommendations. This independent assessment further demonstrated BFN commitment to improve the SE program and, subsequently, the quality of plant technical support. Review of technical support products and discussions with plant management staff indicated the support provided by the Technical Support Organization was generally adequate. Documentation of PIRs, TSMs, EERs, and EWRs provided the primary basis for this assessment. Exceptional work products were identified with some EERs and these were generally accomplished in conjunction with NED. Description of a problem or issue was generally good. Although root cause determination or generic applicability reviews were not exceptionally thorough or comprehensive, they were adequate. Discussions with maintenance management indicated improved technical support performance in the past year based on the reduction in maintenance WR/JO (trouble tickets) backlog. Operations management indicated that variations in SE experience level was a factor in the quality of support provided. Problem resolutions occasionally addressed the short term rather than a permanent fix. For example, PIR 90-036 addressed erratic operation of a valve. The recommended resolution to increase testing of the valve did not resolve the problem nor indicate when the testing was to be discontinued. Both organizations indicated an increasing reliance on technical support staff.

Technical Support Memoranda provided a mechanism to document technical support activity and provide timely response to requests for assistance. Overall, this was a good mechanism for documenting the plant technical support interface. Procedural guidance was adequate and responses were technically sound. The volume of TSMs demonstrated an active technical support interface. In 1989, 866 TSMs were generated, 457 by August of 1990. The following TSMs were reviewed:

90-151	89-656	90-169
89-54	89-704	90-306
89-585	89-768	90-328
89-586	89-817	90-455
89-587	89-829	90-457
89-601	89-840	89-784

An exception to otherwise adequate engineering performance documented on TSMs was identified with TSM 89-784. This item addressed seven RHR relief valves which failed the ISI setpoint test. The TSM stated the valves were to be repaired or replaced; however, there was no documentation available concerning the cause of failure or why cause determination was unnecessary.

PIRs provide a mechanism for the identification and resolution of plant problems. PIRs assigned to Technical Support were characterized by thorough event descriptions. Root cause determinations were generally adequate. It was not always clear whether generic applications were addressed. The following PIRs were reviewed:

89-26	89-42	90-19	89-26
89-27	89-43	90-15	
89-31	89-44	90-04	
89-33	89-45	90-24	
89-35	90-08	89-18	

PIR 89-31 addressed Drywell Fan Cooler Failures which occurred in June and September of 1989. Although the PIR stated a disassembly and evaluation was planned, no cause had been determined one year later. PIR 89-044 addressed a heater drain valve failure. The cause determination was weak. PIR 90-019 addressed leaking SRVs. The evaluation strongly supported the main seat/disk as the leak location; however, the final conclusion stated the pilot valve as the leak source. PIR 90-15 addressed an SRV failure to close following a periodic test. Technical Support performed a good evaluation by recreating the failure conditions on a bench test, but were unable to determine cause. Cause determinations for SRVs were requested of the vendor.

EERs reviewed demonstrated a higher quality engineering product. EER 89-0199 addressed an RHR service water pump discharge valve gasket failure. The technical evaluation of the gasket material was thorough, generic applicability reviews comprehensive, and proposed corrective action sound. EER 89-0166 adequately evaluated acceptable service water flow to RHR for LOCA containment cooling. EERs 89-0179, 89-0047, and 90-0170 demonstrated good engineering support via effective problem description, safety evaluation and resolution. EERs reviewed also demonstrated effective interaction between the Technical Support Organization and NED.

EWRs were reviewed by the NRC in June 1990 (NRC Inspection Report No. 50-324,325/90-23). This engineering product was identified to be adequately controlled.

Independent overview of technical support activity in the previous year has been weak. QA audits performed included QAA/0102-89-01 and QAA/0021-90-01. The audits primarily addressed NED and design control activities. Technical Support Organization activities were addressed to a

minor degree in these audits. It was noted that the audits were performance based and routinely used technical specialists. This reflected an improvement in the quality of corporate audits prior to 1989. In general, although audit quality was improved, these audits were not focused on the Technical Support Organization's performance, i.e., programs and processes.

The onsite QA organization did not provide independent overview of Technical Support performance. QA surveillance activity was accomplished by an onsite QA engineering staff of four engineers whose primary activity was in-line review of EERs. This was an important function and contributed to an improved engineering product; however, this did not provide an assessment of engineering performance. There was evidence of narrow focused assessments of Technical Support performance in Surveillance Reports 90-24 and 90-28 which reviewed implementation of specific IAP corrective action items.

Discussions with QA staff and management indicated an awareness of a lack of independent oversight activity for the Technical Support Organization. A corporate audit is scheduled for late 1990 which will specifically address the Technical Support Organization programs and processes. Onsite QA organizational activities were evaluated in response to weaknesses identified by the NRC and licensee. These changes are anticipated for implementation in December 1990. Although there has been a deficient independent oversight of the Technical Support Organization in the previous year, it was evident the licensee has identified the weakness and was in the process of resolution.

In conclusion, the Technical Support Organization at BNP was improving. The organization structure and staff changes have improved the onsite technical support capability. Review of engineering products demonstrated generally adequate performance. Experience level remains a concern, particularly with respect to system engineering, due to a continued high turnover rate. Although the licensee has taken actions to address a System Engineering training weakness, results do not yet demonstrate improvement. Review of engineering activity demonstrated the Technical Support Organization has established active interfaces with the plant staff and NED organizations.

5. Exit Interview

The inspection scope and results were summarized on August 17, 1990, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

E. Acronyms and Initialisms

AI	Administrative Instruction
BNP	Brunswick Nuclear Project
CP&L	Carolina Power and Light
DBD	Design Basis Document
D/G	Diesel Generator
DET	Diagnostic Evaluation Team (Inspection)
EER	Engineering Evaluation Report
ENP	Engineering Procedure
EWR	Engineering Work Request
FSAR	Final Safety Analysis Report
HPCI	High Pressure Coolant Injection
IAP	Integrated Action Plan
ISI	Inservice Inspection
LCO	Limiting Condition of Operation
LER	Licensee Event Report
MCC	Motor Control Center
MOU	Memorandum of Understanding
NED	Nuclear Engineering Department
NRC	Nuclear Regulatory Commission
PIR	Plant Incident Report
RFO	Refueling Outage
RHR	Residual Heat Removal (system)
SALP	Systematic Assessment of Licensee Performance
SBGT	Standby Gas Treatment
SE	System Engineer
SRV	Safety Relief Valve
TS	Technical Specification
TSM	Technical Support Memorandum
WR/JO	Work Request/Job Order