ENCLOSURE

INITIAL SALP REPORT

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE

INSPECTION REPORT NUMBER

50-325/91-37 AND 50-324/91-37

CAROLINA POWER AND LIGHT

BRUNSWICK UNITS 1 AND 2

OCTOBER 1, 1990 - NOVEMBER 2, 1991

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I. INTRODUCTION

The Systematic Assessment of Licensee Performance (SALP) program is an integrated NRC staff effort to collect available observations and data on a periodic basis and to evaluate licensee performance on the basis of this information. The program is supplemental to normal regulatory processes used to ensure compliance with NRC rules and regulations. It is intended to be sufficiently diagnostic to provide a rational basis for allocation of NRC resources and to provide meaningful feedback to the licensee's management regarding the NRC's assessment of their facility's performance in each functional area.

An NRC SALP Board, composed of the staff members listed below, met on December 17, 1991, to review the observations and data on performance, and to assess licensee performance in accordance with the NRC Manual Chapter NRC-0516, "Systematic Assessment of Licensee Performance." The Board's findings and recommendations were forwarded to the NRC Regional Administrator for approval and issuance.

This report is the NRC's assessment of the licensee's safety performance at Brunswick Units 1 and 2 for the period October 1, 1990 through November 2, 1991.

The SALP Board for Brunswick was composed of:

A. F. Gibson, Director, Division of Reactor Safety, Region II (RII) (Chairperson)
E. W. Merschoff, Acting Director, Division of Reactor Projects (DRP), RII
J. P. Stohr, Director, Division of Radiation Safety and Safeguards, RII
D. M. Verrelli, Chief, Reactor Projects Branch 1, DRP, RII
R. L. Prevatte, Senior Resident Inspector, Brunswick, DRP, RII
E. G. Adensam, Director, Project Directorate II-1, Office of Nuclear Reactor Regulation (NRR)
N. B. Le, Project Manager, Project Directorate II-1, NRR

Attendees at SALP Board Meeting:

H. O. Christensen, Chief, Reactor Projects Section 1A, DRP, RII
R. E. Carroll, Project Engineer, DRP, RII
G. R. Wiseman, Technical Support Staff, DRP, RII
D. J. Nelson, Resident Inspector, Brunswick, DRP, RII
J. F. Wechselberger, Regional Coordinator, EDO
M. T. Markley, Operations Engineer, Division of Licensee Performance and Quality Evaluation, NRR

II. SUMMARY OF RESULTS

Overall, Brunswick has been operated in a safe manner during the assessment period. Improvement was noted in the areas of Radiological Controls and Engineering/Technical Support. Performance in the areas of Security, Maintenance/Surveillance, and Safety Assessment/Quality Verification declined from last assessment period.

Performance in the area of Plant Operations was good. The philosophy that Operations is in charge of plant activities was clearly established and significant improvement was observed in operator communications. Operations was proactive in identifying plant deficiencies and took an active role in assuring that operator training met their needs and expectations. Problems involving system status control and independent verification continued, but were less frequent than during the previous assessment period. Housekeeping remained good, but declined slightly. The fire protection program was adequate. Overall fire brigade performance during the Unit 1 drywell fire was outstanding, considering the delayed response and communications difficulties encountered. The latter deficiency was scheduled for resolution in 1993.

Improvement in Radiological Controls was attributed to increased efforts in several areas. ALARA programs received increased management support. Considering increases in radiation levels and the scope of outage activities, personnel exposure (although still high) showed that dose reduction efforts were effective. Additionally, the number of personnel contamination events significantly decreased. Problems with previous traversing incore probe replacements and locked high radiation area accesses were corrected. The liquid and gaseous effluent program, as well as the radioactive waste transportation program were generally effective. Plant chemistry was maintained within the guidelines of the Boiling Water Reactor Owner's Group.

Performance in the Maintenance/Surveillance area significantly declined from the improvement noted in the previous assessment period. The decline was due to continued weaknesses in work control and deficiencies identified in emergency diesel generator preventive and corrective maintenance. Improper maintenance had a significant impact on the continuous operation of the units. Three reactor scrams and several forced outages/power reductions were caused by maintenance related activities and equipment problems. One third of all reportable events were caused by personnel errors and procedural problems; most of which were associated with maintenance/surveillance activities. Additionally, one third of all reportable events were associated with component failures. The number of inadvertent engineered safety features actuations also increased. Good maintenance capability was demonstrated when concentrated efforts were applied. The Surveillance Test Scheduling System continued to be an effective tool to ensure periodic surveillances were scheduled when required.

Overall, Emergency Preparedness at Brunswick was adequately maintained to assure appropriate response to emergency events. Classifications of actual events were prompt and correct. During the 1991 exercise, strengths, as well as areas of recommended improvement were identified. Emergency response facilities, equipment, and supplies were properly maintained except for the technical support center/emergency operations facility emergency ventilation system. Repetitive occurrences of delinquent training were a significant concern during the assessment period.

The decline from Security's previous strong performance was due to management's delay in implementing upgrades to the protected area barrier. Management's support and involvement in such areas as staffing and training were considered good. Security staff turnover declined from previous years and firearms and tactical response training was increased. The licensee's programs for Material Control and Accountability and Fitness for Duty were effective.

Significant improvement in the Licensed Operator Requalification program and the second unit's recirculation pipe replacement was reflective of the performance in the Engineering/Technical Support area. Engineering support of outage and maintenance activities was generally successful, with the exception that sufficient technical support was not provided for emergency diesel generator maintenance. The design basis reconstitution program continued, with indications that an effective review was being conducted. System engineers were generally found to be knowledgeable and well acquainted with past and present system performance.

Inconsistent performance was demonstrated in the area of Safety Assessment/ Quality Verification. With the implementation of a revised corrective action program in January 1991, the licensee took a significant step toward lowering the threshold for identification and investigation of problems. However, corrective actions to prevent recurrence of problems failed in several functional areas. Reorganization of Quality Assurance functions to the corporate centered Nuclear Assessment Department resulted in a lapse of assessment performance prior to demonstrating some effectiveness towards the end of the period. Plant Nuclear Safety Committee effectiveness and 10 CFR 50.59 evaluations were improved. The assignment of a full time Integrated Action Plan coordinator had a positive affect on that program's implementation. Licensing actions were generally well prepared and timely, and cooperative communication was maintained.

Functional Area	Rating Last Period	Rating This Period
Plant Operations	2	2
Radiological Controls	2	2 (improving)
Maintenance/Surveillance	2 (improving)	3
Emergency Preparedness	2	2
Security	1	2
Engineering/Technical Support	3	2
Safety Assessment/ Quality Verification	2	3

III. CRITERIA

The evaluation criteria which were used, as applicable, to assess each functional area are described in detail in NRC Manual Chapter 0516. This chapter is in the Public Document Room files. Therefore, these criteria are not repeated here but will be presented in detail at the public meeting to be held with licensee management on January 23, 1992.

IV. PERFORMANCE ANALYSIS

A. Plant Operations

1. Analysis

This functional area addresses performance of activities directly related to operating the units.

The plant was operated in a safe and conservative manner during the assessment period. Four automatic reactor trips (two on each unit) occurred during power operation, as opposed to five automatic reactor trips last assessment period. The two on Unit 1 resulted from an improperly set generator overcurrent protection relay and closure of the main steam isolation valves during a surveillance restoration. A blown feedwater control circuit fuse and the performance of a "shutdown condition" computer point calibration procedure caused the two reactor trips on Unit 2. Additionally, the units were collectively maneuvered through nine startups and five controlled shutdowns without incident. Licensee performance during the above reactor trips, startups, and shutdowns was considered good.

Operations was adequately staffed with five shifts. The reorganization of Operations (i.e., a new Operations manager and new personnel in shift supervisor positions) resulted in improved supervision of Operations' activities and clearly established the philosophy that Operations was in charge of plant activities. This was further emphasized during the daily coordination meetings which were run by Operations management and the shift supervisors. Shift supervisor led shift turnover briefings were also detailed and effective. The previous weak performance in operator communication significantly improved following the May 1991 implementation of a Site Command, Control and Communications Manual, BSP-50. This procedure, which requires "repeat back" communications, was well accepted by operators and other plant organizations. Overall these changes resulted in improved attitudes and better performance from plant operators.

Plant housekeeping and equipment physical appearance remained good, but declined slightly since the last assessment period. Emphasis continued to be placed on resolving annunciator problems. This resulted in fewer lit annunciators and less nuisance alarms.

The Emergency Operating Procedures (EOP) were revised and upgraded in late 1990 and were made more user friendly. This contributed to the notable improvements observed in EOP usage and understanding during the June 1991 licensed operator requalification examinations.

The implementation of weekly system walkdowns by auxiliary operators and the initiatives to upgrade the corrective action program resulted in more proactive identification of plant

deficiencies and generation of a significant number of Adverse Condition Reports by the Operations staff. The backlog of outstanding operating procedure revisions was reduced from over 800 to a more manageable number of less than 100. As a result of the above, operators have gained confidence that identified problems will receive management attention and be corrected.

The licensee still continued to experience problems involving system status control and independent verification; however, the frequency of these errors declined over the assessment period. Such errors occurred more frequently in outages when additional demands and extended work hours were common. Efforts to improve performance included an Automated Clearance Management System, which was implemented as a result of past problems in the clearance area. This system permits electronic storage and retrieval of standard and historical clearances and increased productivity with a goal of reducing clearance errors. Further, as discussed in Section IV.C, the licensee conducted performance enhancement training in an effort to motivate and improve employee performance. These efforts however, were not fully effective in preventing operator errors in some instances. Examples include the October 3, 1991 failure to correctly reposition (and independently verify) the Unit 1 B train residual heat removal heat exchanger bypass valve and the September 27, 1991 inappropriate positioning of the Unit 2 scram discharge volume high level trip bypass switch which resulted in a reactor protection system actuation.

Operations took an active role in assuring that operator training met their needs and expectations. As discussed in Section IV.F, significant improvement was seen in the operator requalification and initial operator examinations given in June 1991. The use of the simulator to study transient response and to duplicate and analyze plant trips had a positive impact on solving problems, as well as increasing operators' confidence in their ability to respond to events and transients.

The licensee's fire protection program and related procedures were adequate. Early in the assessment period a fire occurred in the Unit 1 drywell personnel access hatch due to overloading of temporary power cables being used in post weld heat treatment activities. The fire brigade's response was delayed by the control room until the existence of the fire was confirmed. Additionally, difficulties were identified with fire brigade communications. Once mobilized, the fire brigade's overall performance was considered to be outstanding. Subsequent to this event, the fire brigade's mobilization threshold was lowered in order to improve response time. Licensee corrective actions related to identified communication difficulties were scheduled for completion in 1993.

During the assessment period five violations were cited, with three related to an event that occurred in the previous assessment period.

2. Performance Rating

Category: 2

3. Recommendations

A normal level of inspection effort is recommended.

B. Radiological Controls

1. Analysis

This functional area addresses those activities related to radiological controls, radioactive waste management, effluent and environmental monitoring, water chemistry, and transportation of radioactive materials.

With management support, the radiation protection and "as low as reasonably achieveable" (ALARA) programs improved over this assessment period. To a large degree, the improvement was attributed to the implementation of innovative ideas and improved management effectiveness. During this assessment period, there were reductions in calendar year collective dose, personnel contaminations, and contaminated square footage.

In past assessment periods, weaknesses were noted in the audit program. Although some improvement was seen early during this assessment period, a corporate-led audit of the radiation protection program in May 1991 was found to be neither probing nor well documented. This was the first audit performed by the newly formed Nuclear Assessment Department.

The licensee experienced an increase in radiation levels by a factor of eight as a result of hydrogen water chemistry. The hydrogen water chemistry program was postponed after a recommendation by the licensee's Elevated Exposure Rate Task Force (EERTF) and subsequent study which showed hydrogen water chemistry as the major contributor to the increase in drywell dose rates. The EERTF was very active in identifying problems and initiating actions to reduce dose rates at the plant level. The Corporate Dose Committee and Dose Reduction Steering Committee provided minimal support since key members had been reassigned and continuity of their work was disrupted.

Collective dose was reduced primarily by reducing source term and outage duration. In an effort to reduce the source term, the removal of stellite pins and rollers from the control rod blades was accelerated; and chemical decontamination of the recirculation system was performed. The licensee realized a substantive dose savings for the 1991 Unit 2 outage due to the chemical decontamination. Efforts to reduce outage duration included minimizing late outage scope additions and utilizing a spent fuel pool cooling assist system during the 1991 Unit 2 refueling outage which allowed fuel off load operations to begin much earlier than previously experienced. Other effective dose reduction efforts included the successful flushing of radioactive hot spots, use of temporary shielding, use of closed circuit television cameras in high radiation areas, use of a pre-recorded tour during pre-job briefings, improved drywell coordination, and decreasing the number of badged personnel on site by approximately 25 percent. Significant dose savings also resulted from maintenance initiatives. For example, improved reactor vessel head removal and installation tools decreased head removal and re-installation time, as well as reduced the number of personnel required in the reactor cavity. Additionally, the development of a bench testing rig for nuclear instrumentation drive limit switch coarse adjustment reduced undervessel time by approximately 40 percent. Additionally, photo isometric picture boards showing major component locations, dose rates, and room orientation were effectively utilized during this assessment period.

Collective dose in the previous assessment period, which encompassed a Unit 2 refueling outage and recirculation pipe replacement, was 1644 person-rem. In comparison, the collective dose of 1659 person-rem for this assessment period was reflective of the higher dose rates caused by hydrogen water chemistry and an increase in outage work scope. The scope of work during this assessment period included a Unit 1 refueling outage, which involved both a recirculation pipe replacement and core spray safe end work, as well as the front end work for a subsequent Unit 2 refueling outage. Upon cessation of hydrogen water chemistry, dose rates decreased from a factor of eight to three times higher than startup dose rates. After chemical decontamination, dose rates were further reduced to pre-hydrogen water chemistry levels. In addition, the application of experience gained from the 1990 Unit 2 recirculation pipe replacement resulted in similar outage work evolutions being accomplished during a shorter timeframe; thus reducing attributable collective dose. Full benefits of the ALARA program began to be realized towards the latter third of the period. At the end of this assessment period, the collective dose was approximately 200 person-rem below the goal projection. Another indication of improvement in the ALARA program was the reduction of non-outage operational personnel dose from a weekly average of 6.6 person-rem during the last assessment period to a weekly average of 4.8 person-rem during this period.

The number of personnel contamination events (PCEs) was decreased significantly. The license experienced 328 PCEs this assessment period as opposed to 525 in the previous period. The plant averaged 65,000 square feet (ft^2) of contaminated area last assessment period with a significant reduction to 46,000 ft^2 during this assessment period. Primary in the reduction of PCEs was the successful drywell decontamination at the beginning of the 1991 Unit 2 outage. Also attributed to the decreases in PCEs and contaminated area was an increased awareness on the part of the workers and overall support from management to control contamination at its source.

An event occurred in the previous assessment period when a procedure was performed incorrectly for replacing traversing incore probes (TIP). A special inspection was performed during this assessment period to review training, procedures, engineering controls, and job performance associated with another TIP replacement in June 1991. The inspection revealed that the licensee had corrected all previously identified radiological problems prior to performing this operation. Also, good engineering controls and ALARA methods were used during the dose intensive operation. Overall, no radiological problems were identified.

A concern was expressed in the last SALP regarding access control for high radiation areas. Accordingly, the licensee implemented corrective actions which included the installation of 17 self-closing steel bar doors and improving high radiation area key controls. Since implementing these measures, no other such problems were identified.

The liquid and gaseous effluent control program was effective. Doses from liquid and gaseous effluents for calendar year 1990 and the first half of 1991 showed no significant changes and were well within the applicable limits. There were seven unplanned releases plus one release resulting from the incineration of waste oil. None of these exceeded specified limits and were characterized as "Non-routine Releases." The radiological environmental monitoring program also continued to be effective with no significant radiological consequences attributable to the operation of the plant due to inhalation, ingestion, or direct exposure pathways. In addition, the Meteorological Monitoring Program was adequate to perform the intended purpose. Monitoring instrumentation was well maintained and calibrated.

Within the area of radioactive waste transportation, the licensee performed an inadequate verification of the physical condition of a shipping container. This resulted in a low specific activity shipment being made in a metal container which had a small metal fracture. No leakage resulted, and the licensee's corrective actions to this event were prompt and adequate.

Greater emphasis was placed on the requalification of post accident sampling system technicians. Previous requalification requirements allowed the technicians to go as long as two years without actually operating the system. Accordingly, the licensee increased the frequency to once per year.

Plant chemistry was maintained within the guidelines recommended by the Boiling Water Reactor Owner's Group. However, the plant experienced a boron intrusion into the reactor coolant systems of both units. Towards the end of the assessment period, the boron was gradually being reduced through a "feed and bleed" procedure. The licensee's actions in recognizing the problem and devising appropriate corrective actions were seen as a program strength.

During the assessment period one violation was cited.

2. Performance Rating

Category: 2 (improving)

3. Recommendations

A normal level of inspection effort is recommended.

C. MAINTENANCE/SURVEILLANCE

1. Analysis

This functional area addresses those activities related to equipment condition, maintenance, surveillance performance and equipment testing.

Performance in the maintenance/surveillance area was inconsistent. For example, emergency core cooling system/safety system availability was maintained at the good levels achieved in the past several years; however, there was a significant increase in out-of-service time of emergency diesel generators due to extended maintenance periods. Additionally, three reactor trips and seven forced outages/power reductions were caused by maintenance related activities and equipment problems. Also, one third of all reportable events were associated with component failures, and the quality of maintenance was reduced by continued deficiencies in work control.

The number of inadvertent engineered safety feature (ESF) actuation events occurring during testing activities increased to thirteen from five in the previous assessment period. Three of these involved reactor water cleanup system isolations due to electrical noise in the isolation circuitry. One third of all reportable events (including other ESF actuations) were caused by personnel errors and procedural problems. In one case, a reactor scram was caused during the calibration of a feedwater

computer point that was inappropriately performed during power operation. The procedure contained a prerequisite step requiring the unit to be in cold shutdown or refueling during this calibration.

In addition to the example above, other cases revealing weaknesses in work control subsequently occurred throughout the assessment period. A Unit 1 high pressure coolant injection system isolation occurred when a technician attempted to tighten a circuit connection without the controls afforded by the work request/job order process. Maintenance conducted on emergency diesel generator no. 1 without procedural controls resulted in camshaft damage and a forced dual unit outage. Another diesel generator related forced unit outage occurred after a mechanic failed to use an existing procedure to adjust cylinder inlet valve timing on emergency diesel generator no. 3. This led to the timing being incorrectly set. This error went undetected until abnormal engine operation revealed the problem. The licensee's work control process did not detect that documentation for work critical to diesel generator operation was missing prior to running the engine, even though the Automated Maintenance Management System had capabilities to assist in this function. Pre and post job briefings for maintenance activities were begun in the previous assessment period as corrective action for work control deficiencies. These briefings, in conjunction with "Reducing Human Error" and "Please Listen" training, continued during this period. However, as evidenced by the above events, these actions were not always effective.

Inadequacies were identified in the emergency diesel generators' preventive maintenance program during this assessment period. The generator collector ring brush rigging failure in diesel generator no. 3 and governor control system problems on other engines denoted such inadequacies. Similarly, relays associated with the diesel engine turbocharger jet assist feature were omitted from periodic calibrations. Additionally, several examples of failure to take adequate corrective actions with respect to diesel generators were cited in the Electrical Distribution System Functional Inspection. As a result of these and other issues, the licensee had undertaken a broad program to enhance diesel generator maintenance and, hence, their reliability.

The performance of routine preventive and corrective maintenance was not always effective. For example, inadequate maintenance and testing of the Unit 1 refueling bridge contributed to dropping an irradiated fuel bundle in the reactor vessel. Additionally, three residual heat removal system drain valves were found installed without stem packing after a technician's clothing was contaminated when he opened one of the valves. This event also revealed weaknesses in the licensee's post maintenance testing program and inservice inspection hydrostatic testing. However, the licensee demonstrated good maintenance

performance when concentrated effort was applied. Examples of this were the Unit 1 feedwater master controller replacement at power and the short duration Unit 2 outage for recirculation pump motor work. As previously discussed in Section IV.B, the lessons learned from the work control problems encountered during the July 1990 Unit 1 traversing incore probe replacement were effectively applied for the same project in Unit 2 during this assessment period.

During the second half of the assessment period, assignment of a full time chairman to the Site Work Force Control Group (who reports directly to the Plant General Manager) helped provide improved leadership and direction for site work activities. This also resulted in improved scheduling, less coordination problems, and increased productivity.

As previously discussed in Section IV.A, increased emphasis on reduction of control room deficiencies was evident. The daily average number of lit annunciators during normal operation decreased to approximately two per unit and on several occasions "black boards" were attained.

With respect to Technical Specification periodic surveillances, the licensee's Surveillance Test Scheduling System continued to be an effective tool. Only one example each of an incompletely conducted ten year inservice inspection hydrostatic test and a missed drywell airlock interlock check (due to mis-interpretation of multiple drywell entry and exit requirements) were identified. Neither were considered safety significant. As a result of corrective actions taken for events in the previous assessment period, coordination of surveillance activities with control room personnel improved.

The comprehensive component identification labeling program started during the previous assessment period continued. Approximately 50,000 labels and signs were produced and installed with very good results. Use of thermography for predictive maintenance continued to be a strength. The snubber maintenance program remained very successful, as evidenced by no required increase in test sample size since 1987.

In general, the implementation and control of preservice and inservice inspection programs were satisfactory. Documentation of preservice inspection examinations for the replacement of Unit 1 recirculation piping was adequate, but contained numerous transposition errors.

The maintenance procedure upgrade program was 90 percent complete. The quality of surveillance test procedures remained high.

During the assessment period ten violations were cited, with one related to an event that occurred in the previous assessment period.

2. Performance Rating

Category: 3

3. Recommendations

The Emergency Diesel Generator Reliability Enhancement Program should receive high priority and management attention to ensure expeditious results. Effective corrective actions need to be developed and implemented to achieve sustained improvement in the area of work control. The high number of component failures should be assessed to assure that appropriate maintenance is being afforded to all equipment that affects the safe operation of the plant. A high level of inspection effort is recommended.

D. EMERGENCY PREPAREDNESS

1. Analysis

This functional area addresses those activities related to the Emergency Plan and its implementing procedures, support and training of licensee and offsite emergency response organizations, and licensee performance and interaction with offsite support organizations during emergency exercises and events.

Overall, the Emergency Preparedness (EP) program received sufficient management support to maintain the basic emergency preparedness elements needed to implement the Emergency Plan and respective procedures in response to emergency events. The program was maintained in an overall state of operational readiness with adequate facilities, equipment, and staffing.

Performance during the 1991 exercise demonstrated the ability to provide for the radiological safety of onsite and offsite personnel. The response organization demonstrated the ability to implement the Emergency Plan and provide proper protective action recommendations. During the exercise no exercise weaknesses were identified. Team work between the control room, Shift Supervisor, and staff, as well as command and control by the Site Emergency Coordinator (SEC) in the technical support center (TSC), were effective. Areas identified as needing improvement included emergency operations facility (EOF) plant status briefings and communication with offsite authorities. The use of the operating control room with controller provided message cards resulted in some confusion and did not provide the immediate response and realism a control room simulator would have provided.

Emergency response facilities, equipment, and supplies were properly maintained during this assessment period with one notable exception. Specifically, adequate maintenance was not performed on the TSC and EOF emergency ventilation system.

Adequacy of training of emergency response personnel became a significant concern during this assessment period due to repeat violations identified in this area. Early in the assessment period, some emergency response organization training qualifications were identified as delinquent based on training records reviewed. The scheduling of training was the responsibility of a contact scheduler for each group and the system had potential for errors when the contact scheduler was absent for extended periods of time. The licensee identified this problem and had initiated an action plan to correct it. Licensee corrective action for this issue was, however, neither timely nor sufficient. An inspection towards the end of the assessment period identified that training problems still existed and the contact scheduler system still remained. As a result of these findings the licensee initiated a comprehensive training audit in October 1991 which discovered 65 individuals with elapsed training out of 740 members in the emergency response organization. The above indicated a lack of management followup to ensure that identified weaknesses were corrected or that action plans were effectively implemented.

The licensee made three Notifications of Unusual Events during the appraisal period. The events involved a drywell fire, a bomb threat, and a hurricane warning. The event classifications were prompt and correct, and offsite authorities were notified as required.

During the assessment period three violations were cited, with one related to an event that occurred in the previous assessment period.

2. Performance Rating

Category: 2

3. Recommendations

The normal level of inspection effort is recommended.

E. SECURITY

1. Analysis

This functional area addresses those security activities related to protection of vital plant systems and equipment, and shipment of irradiated fuel.

The security force was well staffed, equipped, and trained to perform their assigned duties. Security personnel performance was professional, exhibiting high morale and motivation. Security staff turnover was well managed, resulting in a decrease from previous years. For the most part, security management at both the site and corporate levels was knowledgeable and highly supportive of program activities. The security training staff was dedicated, knowledgeable, and motivated. Annual firearms training increased from 24 hours to 36 hours. Tactical response training was increased to 760 hours and six force-on-force exercises (utilizing laser equipment) were conducted. Management demonstrated support of the security program by providing additional radios and weapons, as well as improvements at the range facility (i.e., new target stands, improved firing lanes, new lights, and installation of telephone communications).

A exception to this notable management support was the untimeliness of the protected area barrier and detection system upgrade project. During the assessment period, there was a high number of compensatory actions due to inoperable security equipment, poor equipment condition, and aging fences. The licensee was advised, during several inspections, that the quality of the closed circuit television pictures used to assess perimeter alarms was degrading. Subsequent to NRC enforcement action, work activities to install new cameras started on September 30, 1991. By the end of the assessment period, the licensee had replaced all the pan/tilt/zoom cameras and 15 of the 18 fixed cameras. The licensee also replaced 4 of the 15 four-foot nuisance fence zones with seven-foot high sections. Additionally, new protected area barrier fencing was in the process of being installed at the end of the assessment period. As the licensee installs the new protected area barrier fence, the detection system is to be upgraded.

The licensee's Fitness For Duty Program was effective at achieving a drug-free workplace while balancing the rights and privacy of the workforce.

Inspection of the licensee's Material Control and Accountability (MC&A) program determined that they had established, maintained and followed approved written MC&A procedures for controlling and accounting for nuclear material. In addition, inspections confirmed that the licensee had adequate procedures for the protection of Irradiated Fuel in Transit.

During the assessment period one violation was cited.

2. Performance Rating

Category: 2

3. Recommendations

Management should reassess the priorities given to such projects as the protected area barrier upgrades, and ensure that the protected area barrier and detection system upgrade project is expeditiously completed. A normal level of inspection effort is recommended.

F. ENGINEERING/TECHNICAL SUPPORT

1. Analysis

This functional area addresses those activities associated with the design of plant modifications; engineering and technical support for operations, maintenance, outages, testing and surveillances; and training.

During the assessment period, engineering support was generally satisfactory. Effective support was provided for the repair of the Unit 1 reactor water cleanup system inboard primary containment isolation valve; design and installation of a spent fuel pool cooling assist system to enable an earlier Unit 2 full core off load; and modification and clearing of Unit 2 reactor bottom head drain line to preclude further related problems such as restarting a tripped recirculation pump during power operation. Also, while performing unrelated engineering walkdowns in Unit 1, engineering personnel identified that supports were missing from a residual heat removal system valve's power supply conduit. However, sufficient technical support was not provided to maintenance personnel during the emergency diesel generator outages discussed in Section IV.C.

Increased engineering oversight and improved planning resulted in quality work during replacement of the Unit 1 recirculation piping. Problems identified during the Unit 2 recirculation pipe replacement in the previous assessment period were resolved. Procurement was strengthened, the craft was better trained, and increased engineering oversight of craft activities was provided. An exception was deficient engineering control over temporary services, which resulted in the overheating of post weld heat treatment cables and a fire in the Unit 1 drywell on December 3, 1990.

The licensee continued their design basis reconstitution program which was implemented at the end of the previous assessment period. Substantive resources were dedicated towards the completion of the program, which is scheduled to continue for several years to final validation. The program had identified some deficiencies in design documentation, but no major design issues were found.

The licensee's program for the implementation of Generic Letter 89-10, Safety-Related Motor Operated Valve Testing and Surveillance, was generally satisfactory for the current stage of implementation. Overall, the staffing level was adequate and engineering support and involvement were good. Training and qualifications for the program were generally good. Positive management involvement was evident by the engineering resources devoted to the program, support of involvement in industry efforts, and testing planned and already performed.

The licensee continued implementing the special program to qualify and certify system engineers. There were 44 Technical Support engineers enrolled in this program. At the end of the assessment period, 19 had completed certification. System engineers were generally found to be knowledgeable of their assigned systems and well acquainted with system problems both past and present.

Design documentation for several temporary conditions lacked sufficient detail to provide a basis for acceptability. Examples were cases where the licensee: had installed a non-seismically qualified replacement air compressor in one of the EDG's air start system; had used a non-Q voltage balance protective relay in class 1E 4160 V switchgear; and had not replaced non-environmentally qualified asbestos-insulated wire in DC motor control centers located inside the containment drywell. Additional documentation and discussions with the licensee's engineering staff provided evidence to support the acceptability of the existing conditions.

Progress was made towards reducing the number of existing temporary conditions, but the backlog remained high. Insufficient emphasis was placed on correcting existing problems which were identified on Operations' "Ten Most Needed" modifications list. Only two of these items were completed on each unit during the assessment period.

Operator training significantly improved since the last assessment period as evidenced by the NRC operational evaluations conducted during October 15-18 and November 8, 1990, and the initial and requalification examination results that were conducted during 1991. Strengths were identified in the areas of Communications, Command and Control, Emergency Core Cooling System operations and interlocks, Emergency Operating Procedure usage and in the reactor operators' (RO) knowledge and understanding of the Emergency Operating Procedures. Also, the simulator was constantly updated to reflect plant modifications and to resolve minor deficiencies as they arose.

Due to the operator training problems identified in the last assessment period, the licensee performed a root cause analysis and incorporated their corrective actions into the Integrated Action Plan. However, not all aspects of their long-term corrective actions were adequately scheduled.

During the NRC Operator Evaluation in October 1990, three of three crews and nine of eleven operators (82 percent) performed satisfactorily on the operating test. During the week of June 3, 1991, all applicants (100 percent) passed an initial operator examination which was conducted for five senior reactor operator (SRO) and four RO applicants. Nine of nine ROs and twelve of thirteen SROs (95 percent), and six of six crews passed the requalification examinations which were administered during the weeks of June 10 and June 24, 1991. Eight of eight (100 percent) operators passed the October 1991, Generic Fundamentals Examination Section.

During the assessment period no violations were cited.

2. Performance Rating

Category: 2

3. Recommendations

A normal level of inspection effort is recommended.

G. SAFETY ASSESSMENT/QUALITY VERIFICATION

1. Analysis

This functional area addresses those activities related to licensee implementation of safety policies; license amendments, exemptions, and relief requests; response to Generic Letters; Bulletins, and Information Notices; resolution of safety issues; reviews of plant modifications performed under 10 CFR 50.59; safety review committee activities; and the use of feedback from self-assessment programs and activities.

The revised corrective action program, implemented in January 1991, lowered the threshold for identification and investigation of problems. There were 534 adverse condition reports (ACRs) written since program implementation; 205 of which remained open and under review at the period's end. The number of ACRs written steadily increased, with deficiencies being reported by all areas. This program, which suffered from insufficient initial staffing, new program development, and other growth problems, appeared to be accepted by the line organizations. Although recognized as an improvement over the previous program, root cause analysis was not always effective. The safety assessment and reporting of the December 1990 drywell fire, the January 1991 root cause investigation of a dropped fuel bundle, and the investigation into the Anchor Darling valve and ASCO solenoid valve problems were examples of detailed and successful reviews. However, there was evidence of corrective action program ineffectiveness in a number of the functional areas. Examples of this were independent verification problems discussed in Plant Operations, diesel generator maintenance and

repetitive work control problems discussed in Maintenance/ Surveillance, repetitive training deficiencies discussed in Emergency Preparedness, and protected area barrier degradation discussed in Security.

The effectiveness of the Plant Safety Review Committee was improved through the efforts of the new Plant General Manager, who was assigned in February 1991. The active participation and numerous questions from each member has led to better resolution of difficult problems.

The Quality Assurance (QA) organization functions were transferred to the Nuclear Assessment Department (NAD) on January 1, 1991. This organization is comprised of a corporate nuclear assessment group located at the corporate offices and a project assessment group located at each site. The corporate group provides functional assessments in the areas of environmental and radiation control, operations, maintenance, engineering and technical support, and nuclear safety review. Each site has a functional organization to cover each of these areas except nuclear safety review. NAD appeared to have been essentially staffed by the end of the assessment period. However, the initial lack of management oversight and direction during the transition from QA to NAD hampered the licensee's efforts towards achieving an effective nuclear assessment program. When NAD first assumed their duties and took over all functions previously performed by QA, no procedures were developed and only a few of the essential positions were filled. The administrative and technical procedures were not developed or implemented until after May 1, 1991. The staffing and training of personnel followed the procedures. For the most part, initial assessments performed by NAD were lacking in detail and substance. They did show improvement after goals and guidelines were established and personnel gained experience. The fire protection program assessment completed at the end of the assessment period indicated that NAD was beginning to provide quality assessments.

The onsite Quality Control (QC) group was reorganized in conjunction with NAD implementation. Reporting to corporate management, QC was adequately staffed for their assigned functions. Their inspections primarily focused on welding, non-destructive examination, modifications, receipt inspection, and pre-established hold points in maintenance procedures. QC attempted to increase inspection of overall work activities as opposed to pre-established hold points; however, only minimal progress was made in this area. The majority of maintenance task assessments were accomplished by NAD and peer or supervisory review.

Licensee event report (LER) quality was considered adequate and covered the major aspects of events, including component or system failures that were contributing factors. Supplemental reports, such as that on the ASCO solenoid valve issue, were noteworthy. However, in one LER the licensee omitted pertinent information regarding the Unit 1 forced outage in October 1991. The overall program for monitoring and reporting defects and non-compliances, as required by 10 CFR 21, was effective.

10 CFR 50.59 Safety Evaluations have improved since the new procedure, AI-109, Plant Nuclear Safety Committee Administration, was implemented under the Brunswick Integrated Action Plan (IAP). With respect to the IAP, the licensee continued to implement and monitor the effectiveness of its related programs. The assignment of a full time IAP coordinator during the assessment period began to have a positive effect on assuring proper program implementation and the performance of independent assessments and effectiveness reviews. The majority of the IAP items had been implemented with positive results. However, as discussed above, the corrective action and nuclear assessment programs were not fully effective by the end of the assessment period.

The licensee's eighteen month agenda continued to be an effective tool to manage and track licensing action submittals. License amendment requests were generally well prepared, with adequate information. For example, requests submitted in support of the Unit 2 refueling outage that began on September 11, 1991, contained adequate "no significant hazards considerations" evaluations and information for the staff to conduct timely reviews. Other Technical Specification change requests, one relief request and an exemption request were also well documented with sufficient information for the staff to evaluate. However, in one request for temporary waiver of compliance to a Technical Specification requirement, the licensee did not provide adequate justification to allow both Units 1 and 2 to continue operation beyond the Technical Specification 7-day out-of-service time when Emergency Diesel Generator No. 1 could not be restored to service due to an inadvertently damaged camshaft.

All but one request were submitted on a timely basis. The untimely request, which was received by the staff on August 22, 1991, concerned a one-time extension for an EDG allowed outage time from 7-days to 14-days. The licensee also anticipated their licensing needs such that no emergency Technical Specifications were requested.

Overall, the licensee maintained good communication with the staff during meetings, and telephone conference calls to discuss technical resolutions of licensing activities. However, the licensee's corporate licensing personnel were not always fully aware of plant operational events.

Licensee actions to resolve the General Design Criterion 17 issue were noteworthy. This resulted in a planned modification to enhance the off-site power supply system and expand the on-site standby power source.

Licensee responses to Generic Letters (GL) and other generic communications have been timely and usually met staff requirements. Examples of such responses include those to GLs 89-10, 89-13, 88-01, 90-09, and 91-06. In the response to GL 88-01, the licensee was prompt in submitting the Unit 1 intergranular stress corrosion cracking inspection results in accordance with the GL and NUREG-0619 requirements. During the Unit 1 refueling, the licensee found an indication on a feedwater nozzle weld, promptly reported it, and submitted an evaluation for the indication. The staff found their submittals to be well documented, the meeting with the staff to be well supported with experts from the industry, and the technical justification for the unit's continued operation for cycle 8 to be acceptable. However, in the response to GL 88-12, the licensee's proposal to replace the existing fire protection license condition with a standard condition did not follow the staff guidance provided in that GL.

During the assessment period four violations were cited, with one related to an event that occurred in the previous assessment period.

2. Performance Rating

Category: 3

3. Recommendations

Declining performance in Maintenance/Surveillance and Security indicates that concentrated effort needs to be expended to implement prompt, effective corrective actions once deficiencies are identified. Continued strengthening of assessment by NAD is imperative in order to verify independently that corrective actions are effective and to identify potential problems before they occur. A high level of inspection effort is recommended.

V. SUPPORTING DATA

A. Licensee Activities

Unit 1 operated with an availability factor of 46.15 percent. At the beginning of the assessment period the unit was at day four of a refueling outage that ended on February 26, 1991. Recirculation pipe replacement was the major work item in the outage. A reactor trip from full power occurred on March 5, 1991, due to an incorrectly calibrated generator overcurrent relay. The unit returned to service on March 8, 1991. A forced outage for both units began on March 29, 1991, due to the expiration of a Limiting Condition for Operation

(LCO) on emergency diesel generator (EDG) 1. Unit 1 restarted on May 6, 1991, and operated at full power until July 18, 1991, when a reactor trip occu[illegible] due to a false low water level signal generated during the restora[illegible] from a level instrument calibration check. Restart occurred on July 25, 1991, and normal operations were conducted until a forced outage on September 2, 1991, due to necessary repairs on reactor water cleanup primary containment isolation valves. The unit restarted on September 9, 1991, but sustained another forced outage on October 15, 1991, due to the expiration of an LCO on EDG 3. Restart occurred on October 21, 1991, and normal operations were conducted through the end of the assessment period.

Unit 2 began the assessment period at full power. A reactor trip from full power occurred on October 12, 1990, due to a blown fuse in the feedwater level control system. Restart occurred on October 18, 1990, and normal operations were conducted until January 25, 1991, when a reactor trip from full power occurred as a result of a feedwater level control system computer point calibration. The unit was restarted on January 30, 1991, and conducted normal operations until the forced dual unit outage on March 29, 1991, due to the EDG 1 LCO expiration. Restart occurred on May 7, 1991. Full power operations were conducted until June 8, 1991, when the unit was separated from the grid [illegible] permit a power reduction to allow maintenance on [illegible] recirculation pump motor. The unit was reconnected to the grid on the same day and full power operations resumed. A temporary power reduction to 50 percent was required on June 30, 1991, in response to the loss of the 2B steam jet air ejector. On August 23, 1991, a power reduction to approximately 24 percent was conducted to permit oil addition to both recirculation pump motors and to perform testing on the main generator [illegible]ltage regulator. The unit returned to full power within 24 ho[illegible]rmal operations continued until the unit entered a refuel[illegible]g [illegible] September 11, 1991, which continued through the end of the [illegible]ssment period. Unit 2's availability factor was 73.42 percent.

Significant management changes were made at the site. The Manager - Operations position which was vacant at the end of the previous assessment period was filled on a temporary basis since the selected individual had never held a Senior Reactor Operator license. This required a Technical Specification change which was [illegible]anted for an 18 month duration, allowing time to select and train another individual. The Manager - Regulatory Compliance entered the SRO training program and was replaced by the Shift Tech[illegible]cal Advisor - Supervisor. The Plant General Manager vacated the position to become the Corporate Quality Control Manager and was replaced by the Assistant to the Vice President - Brunswick Project which was not refilled. The Manager - Environm[illegible]al and Radiological Controls (E&RC) moved to the Corporate Nuclear Assessment Department and was replaced by the former Manager - E&RC/Chemistry. The Manager - Control and Administration assumed the position of Manager - Nuclear Business Operations under the Senior Vice President - Nuclear and was replaced by the former Manager of CP&L's Lee Plant. Also during the assessment period the

Manager - Project Assessment vacancy was filled. In addition, other personnel changes have included key first line supervisors. The shift manager positions created during the previous assessment period were discontinued and replaced with SRO Shift Outage Coordinators during outages.

B. Direct Inspection and Review Activities

During the assessment period, 30 routine and five special inspections were performed at Brunswick by the NRC staff. The special inspections were:

December 3-7, 1990; Maintenance Team Inspection Followup

March 25 - April 26, 1991; Electrical Distribution System Functional Inspection

August 12-16, 1991; Health Physics Appraisal

October 21-25, 1991; Motor Operated Valve (Generic Letter 89-10) Inspection

October 30 - November 1, 1991; Fitness For Duty Inspection

C. Escalated Enforcement Actions

1. Orders

None

2. Civil Penalties (CP)

Severity Level III violation (EA 90-154) for Instrument and Control technicians' acts of intentional failure to follow procedure and willful falsification as it relates to the August 19, 1990 Unit 2 reactor trip. (No CP) - (This problem was addressed in the previous SALP report.)

Severity Level III violation (EA 91-023) for a series of breakdowns in the work control process which allowed a "shutdown" computer point calibration procedure to be performed while Unit 2 was operating; thereby causing a reactor trip on January 25, 1991. ($50,000 CP)

Severity Level III problem (EA 91-045) for work control deficiencies identified in March 1991 (i.e., inadequate procedural sequence documentation during performance of calibration activities; loss of emergency bus control power due to improper double verification during clearance activities; and performance of emergency diesel generator maintenance without a procedure, resulting in camshaft damage). ($87,500 CP)

D. Management Conferences

During the assessment period there were 13 management conferences with the licensee. These were:

- October 16, 1990; Enforcement Conference to discuss concerns stemming from the August 19, 1990 Unit 2 reactor trip.
- December 3, 1990; Discussion of the Brunswick Design Bases Reconstitution Program.
- December 19, 1990; Discussion of SALP Cycle 9 Assessment.
- February 26, 1990; Enforcement Conference to discuss concerns stemming from the January 25, 1991 Unit 2 reactor trip.
- May 6, 1991; Enforcement Conference to discuss events which prompted further concerns over work control.
- May 21, 1991; Discussion of the Brunswick Integrated Action Plan (IAP) and Nuclear Assessment Program.
- May 23, 1991; Discussion of Brunswick Unit 1 Cycle 8 operation without the need for a mid-cycle inspection of the N4D Feedwater safe-end/pipe weld.
- June 18, 1991; Discussion of electrical distribution systems and plans to improve off-site power reliability.
- June 19, 1991; Discussion of hydrogen water chemistry experience and system operation at Brunswick.
- August 2, 1991; Enforcement Conference to discuss the Electrical Distribution System Functional Inspection findings.
- August 20, 1991; Brunswick self-assessment.
- October 3, 1991; Discussion of IAP status.
- November 1, 1991; Discussion of October 1991 Emergency Diesel Generator (EDG) 3 outage activities and planned activities for EDG 4.

E. Confirmation of Action Letters

None issued.

F. Reactor Trips

Unit 1

Two automatic reactor trips occurred:

March 5, 1991 - The unit experienced a trubine trip/reactor trip from 100 percent power due to an improperly set generator overcurrent protection relay.

July 18, 1991 - A trip from 100 percent power resulted from a Group 1 (Main Steam Isolation Valves) isolation that was generated from a false low reactor vessel level signal during a surveillance restoration.

Unit 2

Two automatic reactor trips occurred:

October 12, 1990 - A reactor trip from 100 percent power resulted from a reactor water level transient caused by a blown feedwater control circuit fuse.

January 25, 1991 - A feedwater transient, caused when a "shutdown" computer point calibration procedure was performed "at power", resulted in a high water level reactor trip from 100 percent power.

G. Review of Licensee Event Reports (LERs)

During the assessment period a total of 59 LERs were analyzed. The distribution of these events by cause, as determined by the NRC staff, was as follows:

Cause	Unit 1 or Common	Unit 2	Total
Component Failure	11	11	22
Design	4		4
Construction, Fabrication, or Installation	3		3
Personnel			
- Operating Activity		3	3
- Maintenance Activity	5		5
- Test Calibration Activity	8	2	10
- Other	3	1	4
Other	3	5	8
TOTAL	37	22	59

Note 1: With regard to the area of "Personnel Errors", the NRC considers lack of procedures, inadequate procedures, and erroneous procedures to be classified as personnel error.

Note 2: The "Other" category is comprised of LERs where there was a spurious signal or a totally unknown cause.

Note 3: One additional LER was voluntary and not considered in this report.

H. Licensing Activities

During the assessment period the staff completed 74 licensing activities. This included the issuance of 23 Technical Specification amendments; the granting of one relief request; completion of 30 (non-amendment) safety evaluations; and review of seven generic letters and two multi-plant actions.

I. Enforcement Activity

FUNCTIONAL AREA	NO. OF DEVIATIONS AND VIOLATIONS IN EACH SEVERITY LEVEL (SL)					
	Dev.	V	IV	III	II	I
Plant Operations			5*			
Radiological Controls			1			
Maintenance/Surveillance			7	3*		
Emergency Preparedness			3*			
Security			2			
Engineering/Technical Support						
Safety Assessment/Quality Verification			4*			
TOTAL			21	3		

*Includes violations which were related to an event that occurred in the previous assessment period (EA 90-154): 3 SL IV (Plant Operations, 1 SL III (Maintenance/Surveillance), 1 SL IV (Emergency Preparedness), and 1 SL IV (Safety Assessment/Quality Verification).