ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE

INSPECTION REPORT NO. 50-352/87-99

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION

UNIT 1

ASSESSMENT PERIOD: FEBRUARY 1, 1987 - APRIL 30, 1988

BOARD MEETING DATE: JUNE 8, 1988

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TABLE OF CONTENTS

I. INTRODUCTION

A. Purpose and Overview

The Systematic Assessment of Licensee Performance (SALP) is an integrated NRC staff effort to collect observations and data on a periodic basis and to evaluate licensee performance. The SALP process is supplemental to normal regulatory processes used to ensure compliance to NRC rules and regulations. SALP is intended to be sufficiently diagnostic to provide a rational basis for allocating NRC resources and to provide meaningful guidance to the licensee's management to improve the quality and safety of plant operations.

An NRC SALP Board, composed of the staff members listed in Section B, met on June 8, 1988 to review the collection of performance observations and data to assess the licensee's performance at the Limerick Generating Station Unit 1. This assessment was conducted in accordance with the guidance in NRC Manual Chapter 0516, "Systematic Assessment of Licensee Performance." A summary of the guidance and evaluation criteria is provided in Section II of this report

This report is the SALP Board's assessment of the licensee's safety performance at the Limerick Generating Station Unit 1 for the period February 1, 1987 through April 30, 1988. The summary findings and totals reflect a 15-month assessment period.

B. SALP Board Members

Chairman

W. F. Kane, Director, Division of Reactor Projects (DRP),

Members

W. Johnson, Director, Division of Reactor Safety
G. Sjoblom, Acting Director, Division of Radiation Safety and Safeguards
W. Butler, Director, Projects Directorate I-2, NRR
R. Capra, Acting Chief, Projects Branch No. 2, DRP
R. Gallo, Chief, Operations Branch, DRS
S. Collins, Deputy Director, DRP (Part Time)
E. Kelly, Chief, Technical Support Section, DRP
J. Linville, Chief, Projects Section 2A, DRP
R. Clark, Project Manager, NRR

Others

T. Kenny, Senior Resident Inspector, Limerick Unit 1
L. Scholl, Resident Inspector, Limerick Unit 1
R. Gramm, Senior Resident Inspector, Limerick Unit 2
T. Johnson, Senior Resident Inspector, Peach Bottom
J. Williams, Project Engineer, DRP
J. Gadzala, Reactor Engineer, DRP
W. Pasciak, Chief, Effluents Radiation Protection Section, DRSS
T. Dragoun, Senior Radiation Specialist
R. Summers, Emergency Responsive Coordinator, DRSS
R. Keimig, Chief, Security and Safeguards Section, DRSS
H. Gregg, Senior Reactor Engineer, DRS

II. CRITERIA

Licensee performance is assessed in selected functional areas. Each functional area represents areas significant to nuclear safety and the environment, and are normal programmatic areas. The following evaluation criteria were used as appropriate to assess each functional area.

1. Management involvement in assuring quality
2. Approach to resolution of technical issues from a safety standpoint
3. Responsiveness to NRC initiatives
4. Enforcement history
5. Reporting, analysis and corrective actions for operational events.
6. Staffing (including management)
7. Training effectiveness and qualification programs

Based upon the SALP Board assessment each functional area evaluated is classified into one of these performance categories. The definitions of these performance categories are:

Category 1. Reduced NRC attention may be appropriate. Licensee management attention and involvement are aggressive and oriented toward nuclear safety; licensee resources are ample and effectively used so that a high level of performance with respect to operational safety is being achieved.

Category 2. NRC attention should be maintained at normal levels. Licensee management attention and involvement are evident and concerned with nuclear safety; licensee resources are adequate and reasonably effective such that satisfactory performance with respect to operational safety is being achieved.

Category 3. Both NRC and licensee attention should be increased. Licensee management attention or involvement is acceptable and considers nuclear safety, but weaknesses are evident; licensee resources appear strained or not effectively used so that minimally satisfactory performance with respect to operational safety is being achieved.

Trend. The SALP Board may decide to include an appraisal of the performance trend of a functional area. Normally, this trend will only be used when both a definite trend of performance is discernible to the Board, and the Board believes that continuation of the trend will result in a change of performance level.

Improving: Licensee performance was determined to be improving near the close of the assessment period.

Declining: Licensee performance was determined to be declining near the close of the assessment period.

III. SUMMARY OF RESULTS

A. Overall Evaluation

During the assessment period site performance has remained strong despite additional pressure associated with a major corporate reorganization. Site management has been very effective in providing the leadership necessary to achieve this performance, to maintain good morale and to foster a strong safety perspective throughout the site organization. The completion of the reversal in performance in the security area of two SALP periods ago, resulting in excellent performance in the security area during the current assessment period, is the result of strong site management with support from corporate management.

While corporate support was evident for the security area, in other areas such as engineering and technical support, and emergency preparedness ineffective corporate oversight and support has resulted in a decline in performance. In the area of emergency preparedness lack of corporate accountability and oversight extends back into the previous assessment period. While the reorganization has resulted in enhancements in oversight functions associated with the offsite Nuclear Review Board and the unification of the previously fragmented quality organization, further corporate management attention appears to be necessary to assure accountability from corporate support groups.

Strong performance has continued in plant operations, radiological controls, maintenance and surveillance. In operations a strong team of operators, operations management, technical support and site managers have produced a safe operating record. In spite of an unanticipated outage extension, ALARA performance was effective and total radiation exposures compared favorably with other newly licensed BWRs this period. Corporate support for the radiological environmental monitoring was demonstrated in that activities in this area were effectively carried out by contractors. Improvements are evident in the site management of maintenance work backlogs and control of contractors. Deficiencies in maintenance procedures are being corrected and the conduct of maintenance and surveillance is typified by strict adherence to procedures. Safety review committees are used effectively.

Site management and supervision have been effective in maintaining a positive attitude of teamwork at all levels of the organization. This is considered to be the principal factor in the continuation of the overall strong performance exhibited in prior SALP periods.

B Background Activities

1. Licensee

Unit 1 completed a 198-day continuous power run at the end of the previous assessment, followed by a controlled shutdown to repair three valves that were contributing to drywell leakage. The unit began the assessment period at full power and remained at power for the next three and a half months in an end-of-cycle coastdown mode of operation towards the first refueling outage which began on May 15, 1987.

The first Unit 1 refueling outage lasted 108 days. Major activities consisted of: full core offload for refueling and core alterations; a containment integrated leak rate test; license condition modifications including tie-in of the standby gas treatment system to the refueling floor; major corrective maintenance to 20 control rod drives, rebuilding of feedwater valves, the replacement of all 14 main steam safety relief valves, and extensive preventive maintenance including tear-down and overhaul of Reactor Core Isolation Cooling, (RCIC), all four diesel generators and the main generator and turbine.

Startup from the outage began on August 26 and, following minor repairs to High Pressure Coolant Injection (HPCI) steam supply valves, the main generator was synchronized to the grid on August 31. Power ascension occurred over the period September 1 through 7 to 83% power. An automatic scram occurred on September 7 due to a turbine trip on high water level in a moisture separator because of an isolated instrument air supply to the moisture separator level controls. Recovery from the scram began the following day and full power was achieved by September 17. Full power operation continued for approximately five days until an automatic scram occurred on September 19, due to a turbine trip caused by rupture of a weld on an electro-hydraulic control (EHC) system line to a main turbine control valve.

Recovery from the September 19 scram began the following day, but the unit remained at 85% power for the following two months until November 21 while investigations proceeded to a solution for the turbine EHC system vibrations. On November 21, 1987, Unit 1 was returned to full power.

Full power operation continued for 126 consecutive days until a fuel cladding leak was discovered on March 25, 1988 as evidenced by increased steam jet air ejector radiation levels. The licensee suspected the leak to be a form of crud-induced localized corrosion. No detectable increase in offgas releases was experienced, although coolant radioiodine activities increased by a factor of about ten. Reactor power was

maintained below 85% as a precautionary measure for the next two weeks until a planned shutdown was begun on April 8 following 195 consecutive days at power since September 19, 1987.

The planned outage lasted 10 days and was for condenser tube cleaning and circulating water system improvements. Feedwater valve repairs, Intermediate Range Monitor (IRM) replacements and several modifications were also accomplished. Unit 1 was returned to power on April 22. At the end of the assessment period Unit 1 was operating at reduced power because of the fuel leak.

Organizational changes at the station level and at corporate occurred throughout the assessment, including reassignment of the station manager to Peach Bottom and announcement of a new station manager on January 1, 1988. The prospective station manager remained in a special license familiarization training program through the end of this assessment period, and is expected to assume the duties of Limerick Unit 1 Station Manager in August 1988.

The licensee announced a major corporate reorganization of the company's Nuclear Operations and Support Services which became effective on November 1, 1987. Changes included creation of: a Vice President for the Limerick Station, assumed by the former Unit 1 Plant Manager; corporate Vice Presidents for newly formed Divisions of Nuclear Services and Nuclear Engineering; and a Senior Vice President, Nuclear. The reorganization also involved reconstituting the Nuclear Review Board (NRB) to include membership of three senior executives outside of PECo. The site organizations operated in a transition for the latter part of this assessment. The Vice President of Limerick remained in an acting station manager position through the end of the assessment period.

On February 2, 1988, the President and Chief Operating Officer announced his retirement effective March 1, 1988. On February 16, 1988, a new Executive Director Nuclear from outside the PECo organization was announced who subsequently became a PECo employee and assumed the title of Executive Vice President Nuclear on March 13, 1988. The company's Chairman and Chief Executive Officer announced his retirement effective April 13, the date of the licensee's annual board meeting. The Board of Directors elected a new Chairman and Chief Executive Officer, a former PECo Vice President who had recently been elected President and Chief Operating Officer at another utility.

2. Inspection

Two NRC resident inspectors were assigned to the site during the assessment period. A new resident inspector was assigned in December 1987 and a new senior resident in March 1988. The total NRC inspection time expended during the 15 month assessment period was 4,032 hours or 3,226 hours on an annualized basis. Distribution of these hours by functional area is depicted in Table 1. A summary of enforcement activities is provided in Table 2.

During this assessment period, the second year of commercial operations was reviewed as well as the Unit 1 initial refueling outage. NRC inspection teams evaluated restart from the refueling outage in August 1987, the environmental qualification programs in February 1988 and an emergency preparedness exercise on April 6, 1988.

This report includes evaluation of Safety Assessment/Quality Verification as a new functional area. The topics assessed in this new area include Licensing activities as well as what was formerly covered under the Assurance of Quality. Also, Training and Qualifications is no longer a separate functional area and is included.

Refueling activities were evaluated as part of the Engineering/Technical Support functional area for the first time during this assessment period. Fire protection is assessed, as in previous assessments, in the functional area of Operations, since there was no special programmatic inspection in this area. Housekeeping is included in the area of maintenance. Security continued to receive increased inspection effort, as in previous assessments, because of past identified weaknesses.

C. Performance Summary

	Functional Area	Category Last Period (2/1/86 - 1/31/87)	Category This Period (2/1/87 - 4/30/88)
A.	Plant Operations	1	1
B.	Radiological Controls	1	1
C.	Maintenance	1	1
D.	Surveillance	1	1
E.	Engineering/Technical Support	1	2
F.	Emergency Preparedness	1	2
G.	Security and Safeguards	2	1
H.	Safety Assessment/ Quality Verification	*	1
I.	Training & Qualification Effectiveness	1	**
J.	Licensing Activities	2	***
K.	Assurance of Quality	1	***

*Not evaluated as a separate functional area last period
**Criterion for all functional areas, and no longer a separate area
***Now evaluated under Safety Assessment

D. Unplanned Shutdowns, Scrams and Forced Outages

Date & Power Level		Description	Root Cause	Functional Area
6/12/88	Defueled	Reactor scram signal during refuel outage with core offloaded due to radiography in the vicinity of the main steam line radiation monitors.	Inadequate procedure compounded by blocking deficiency	Operations
9/7/87	83%	Automatic scram upon closure of the turbine stop valves caused by high level in a moisture separator. Instrument air valve was not properly positioned.	Drawing did not include individual tag nos. for instrument air root valves	Engineering
9/19/87	90%	Automatic scram due to a main turbine trip caused by the failure of a pipe weld in the turbine electrohydraulic control system. A leak at the failed weld was discovered and a plant shutdown from full power was in progress at the time of the scram.	EHC weld failure induced by new load due to EHC modifications	Engineering
4/9/88	<1%	Automatic scram due to a high flux trip while power was in the intermediate range during a planned shutdown. A half scram had been manually inserted due to IRM inoperability and when power increased due to moderator temperature decrease a trip signal was generated by the 'C' intermediate range monitor (IRM) while set on range 2.	Personnel error	Operations

Date & Power Level		Description	Root Cause	Functional Area
4/9/88	0%	Automatic Scram While in cold shutdown an upscale spike occurred on the 'F' channel IRM (Range 1) due to the failure of the detector. This spike in conjunction with a manually inserted half scram (due to inoperable IRMs) caused a full scram. All rods were fully inserted at the time of the scram thus no rod motion occurred.	Component failure	N/A

IV. PERFORMANCE ANALYSIS

A. Plant Operations (1191 hours; 29%)

Analysis

This area was rated Category 1 in the previous two assessments, with a decreasing number of reportable events attributable to operator error, low scram rates and good safety attitudes exhibited by the operating staff. Exceptions were found in the management of fire protection activities. Improvements were noted in the reduction of unnecessary alarms and improved control room access controls.

During this assessment period the shift superintendent is a recognized part of the station's management structure and the responsibility vested in this role is evident by their visible leadership, a key in the achievement of a successful operating team not exclusively limited to operations personnel. Two new shift superintendents were selected during this period as a result of a rigorous selection process whereby promotions are peer-evaluated and are not solely the result of seniority.

The licensee has placed a high priority on the perception and attitudes of licensed operators. Operator feedback is of paramount importance as evidenced by the shift superintendents' regular briefing to Nuclear Review Board (NRB), the plant incident review committees, and the shift update notebook. Training has been provided to prepare operators to better deal with shift work such that attentiveness is maximized and good morale is maintained. Management's efforts have instilled a philosophy of safe operation.

One scram occurred because an operator did not react to IRM signals during an full rod insertion shutdown for the 10-day condenser outage. Programs devised to prevent scrams include color-coded instrument panels in the auxiliary equipment room; A-day/B-day surveillance test schedules; and a rigorous process for operational condition change PORC review.

Access controls continued to be effective in limiting nonessential personnel and noise in the main control room. However, due to the design of Limerick's control room (common to both units), this is still a concern because of Unit 2 construction and testing activities which the licensee has recognized and continues to underscore in shift meetings and turnovers.

Communication techniques have been refined using administrative guidelines, so that a marked reduction in reportable events attributed to breakdowns in communications is evident. Communications among the plant staff have been enhanced by publication of reports of routine meetings and by tracking issues to completion through a clearly accountable individual. Turnover between shift superintendents is thorough. The shift superintendent is aided by detailed

logkeeping and the use of a marker to track operating problems. As a result, the status and disposition of all problems that develop during the shift are addressed during shift turnover.

Extra licensed expertise was staffed for Unit 1 operation throughout this period. This additional staffing has helped to maintain a good safety record by effectively controlling overtime and is in anticipation of Unit 2 demands. Full-time day work positions were created for shift superintendents as career paths outside of the control room. The licensee has also provided for six month assignments (off shift work) on a rotating basis. The licensee has recruited potential operators with two-year associate degrees or previous reactor experience. All nuclear plant operators (the most senior nonlicensed position) hold reactor operator licenses. An auxiliary shift is strategically used to augment peak day work tasks. A full time position (the 13th SRO) on day shift is dedicated as a supervisor for blocking and permit coordination. This individual has provided for the successful removal and return to service of important plant equipment, as well as elimination of a backlog of maintenance work, better independent verifications, improved engineered safety feature system blocks and ultimately, fewer reportable events.

The shift technical advisor (STA) has been a key in operational problem analysis, as reflected in post-scram evaluations and Upset Reports. The first generation of Unit 1 STAs, who gained experience during power ascension testing and Cycle 1 operation, have been blended into other site organizations such as outage planning and maintenance. This spread of operating expertise has been beneficial.

NRC review of the requalification program in March 1987 found weaknesses with respect to simulator training scenarios, the licensee's examination process and difficulties in the use of emergency operating procedures. Training deficiencies and program weaknesses were corrected by the licensee. Simulator training has proven valuable during several plant feedwater transients in which operators quickly acted to prevent a scram.

In the last quarter of this assessment period, the position of the onsite fire protection engineer was filled with a qualified individual. The fire protection group was realigned and more clearly defined as a station organization. A contract was initiated with a specialist to resolve high priority sprinkler modifications and improvements to the motor driven fire pump. Although both site and corporate management were slow to recognize needed changes the newly organized fire group now appears to have proper staffing, supervision and engineering support and represents a distinct improvement over previous assessments.

Better results were experienced with the use of a computerized system for blocking sequences prepared prior to use. The system reduced errors, particularly for complex evolutions and outage work. Safe accurate blocking sequences were provided during the refueling outage, due in part to the assignment of an extra licensed supervisor for blocking and permit coordination, as well as the practice of independently verifying application and removal of blocks on safety equipment. Few instances occurred during this assessment period where blocking was not properly administered; however, the licensee became immediately aware of these breakdowns due to good communications. The licensee has also devoted experienced licensed staff to prepare Unit 2 blocks. Management commitment of these resources demonstrates recognition of the importance of removal and return to service of safety equipment.

Summary

A strong operating team concept with effective leadership from shift superintendents, integration of technical support organizations, refined communications and explicit support from management have produced a safe operating record. Advanced planning for Unit 2 startup is evident, while the impact on Unit 1 has been minimized. Reductions in reportable events, low scram frequency, and continued good personnel attitudes with ongoing re-organizational pressures are products of the site management commitment to safe operation. Previous fire protection concerns identified by the NRC have been diagnosed and addressed by appropriate staffing and corporate support, but more importantly by a recognition of a need to revise the fire program. The need to apply resources to critical areas, such as permits and blocking, has been quickly recognized. Formalization during this assessment period of previously existing good practices has sustained performance as standards are continually raised.

Conclusion

Category 1

Trend

Board Recommendations

None

B. Radiological Controls (429 hours; 11%)

Analysis

The previous assessment covered the first post-licensing period of refueling and operation and was rated as Category 1. Weaknesses were noted in the areas of ALARA, potential heat stress of workers and review of design modifications, which were attributed to lack of policy making at the corporate level. Minor weaknesses were noted in monitoring non-radiological chemistry parameters. Also, post accident sampling system reliability problems were identified.

1. In Plant Radiation Protection

During this assessment period site management at all levels continues to effectively plan and direct activities related to radiation safety. The station manager personally emphasized the importance of the Station ALARA Review Committee (SARC) with his staff after poor attendance at SARC meetings was noted. The Health Physics supervisors are directly involved in setting daily priorities for routine HP surveillance and other technician activities. During the refueling outage, senior HP technicians were assigned to coordinate HP support in designated areas of the plant. Other technicians were loaned to various work groups such as maintenance to augment GET training of workers, act as an interface for work scheduling, and ensuring incorporation of ALARA into the early stages of job planning. Good management oversight and control of the on-site contractor that collects, transfers for laundering, and restocks protective clothing was noted.

In August 1987, the licensee committed to various improvements in corporate involvement in radiological controls. Implementation was not complete by the end of the current assessment period. Resolution of technical and safety issues related to radiological controls is also sometimes delayed. An excellent Heat Stress program was not implemented until one year after problems became known. The Hot Particle program has been unnecessarily delayed by a management decision to adopt the program being developed at the licensee's Peach Bottom facility, which is progressing slowly. In the interim, indicators of the onset of a hot particle problem such as reactor coolant analysis and personnel contamination reports are being monitored. The licensee's approach to technical issues from a safety standpoint is very good although corporate technical support is lacking and some implementation delays occurred.

The on site program for the calibration and maintenance of radiation survey meters is excellent and is conducted by competent contractor personnel. A "hot tool" crib is under construction that will consolidate into one location all contaminated tools regardless of the ownership. However, the Radiological Awareness Reporting remains weak, as emphasis is placed on prompt correction of problems without the need for documentation which denies management the data to detect adverse trends. This is compensated somewhat by the very good communication that exists between most departments and supervisory levels on site.

ALARA performance continues to be effective with challenging goals selected by site management. Total exposure for the period including the outage was about 174 person-rem. This exceeded the original goal of 150 person-rem due to an unanticipated extension of the outage to deal with additional control rod drive rebuilds and other undervessel work. However, the total exposure compares very favorably with other newly licensed BWR stations.

Training and qualification programs are very well developed and make a positive contribution to the technical performance of the station staff. The training and testing of contractor health physics technicians hired for outage support is effective in ensuring the required knowledge level of radiation safety procedures. An excellent program for the repair and calibration of sophisticated radiation monitoring equipment by Instrumentation and Control (I&C) technicians was noted. This is attributed, in part, to a rigorous training program for I&C technicians which spans several years and only accepts personnel possessing two year degrees.

2. Effluent Control and Environmental Monitoring

The licensee has effective oversight of effluent controls at the site. Positions and clear lines of authority were established in the chemistry and health physics support group who sample and analyze effluents, and implement the Offsite Dose Calculation Manual (ODCM) respectively. Audits were found to be thorough and comprehensive in scope. Staffing was generally complete with little reliance on contractor personnel. There was inadequate review of effluent data as indicated by errors in the licensee's Semi-annual Effluent Release Report which were noted as a result of a change in the computer group's technical staff members who support the effort. Two LERs related to effluent sampling were noted as attributable to personnel error, suggesting a minor weakness in technician training.

An effective Radiological Environmental Monitoring Program (REMP) is being implemented by the licensee. Good corporate management was demonstrated for this program in which all activities are contracted. QA audits are thorough and of sufficient technical depth to adequately assess capabilities and performance of the REMP. Training for both licensee and contractor personnel is effective.

3. Radiological Confirmatory Measurements

The licensee maintains good capability for determination of radioactivity in gaseous and liquid effluents as demonstrated by the comparison of measurements with the NRC Mobile Lab. Clear lines of authority and adequate staffing were noted as positive attributes in management controls. QA audits are conducted at regular intervals, are technically competent and meet stated objectives. Procedures are generally adequate to meet program needs but show indications that timely reviews for accuracy and content may not be done in a thorough manner. Example problems include charcoal cartridge efficiencies that were not correlated to flow and the absence of a requirement for use of a reducing agent for iodine separation. Two LERs relevant to the chemistry area occurred within ten days of each other and were attributed to personnel errors.

4. Non-Radiological Chemistry

Lines of authority are clear and plant senior management support appears strong as evidenced by recent acquisitions of laboratory equipment. In spite of adequate staffing and state-of-the-art measurement equipment, weaknesses in laboratory measurements were identified in the licensee's capability to monitor chemical parameters in various plant systems with respect to Technical Specification, fuel warranty and other regulatory requirements. These findings indicate inattention to detail in the laboratory chemistry measurement program some of which were also identified during the last SALP period.

Summary

During this assessment period, licensee management demonstrated the ability to conduct routine radiological operations and conduct a refueling outage while maintaining a high level of radiation safety performance. In addition, program enhancements and policy improvements were developed and implemented on site in spite of minimal technical support and guidance from the corporate staff. The licensee has been slow to respond to problems in areas such as worker heat stress, hot particles, non-radiological chemistry laboratory measurements and in providing corporate support to the site.

Conclusion

Category 1

Board Recommendations

Licensee

Increased attention should be focused on (1) development of a program for hot particles; (2) weaknesses identified in the non-radiological water chemistry measurement program; and (3) improved corporate support for the site.

C. Maintenance (503 hours; 12%)

Analysis

This area was rated Category 1 in the previous assessment, with good supervision of craft and engineering support noted, system status control and post-maintenance testing as strengths, and excellent equipment and plant reliability.

During this assessment period well organized and effectively managed maintenance programs that are founded upon a teamwork concept were evident. Quality workmanship resulted from excellent craft skill levels, a large amount of specific equipment expertise, and increased participation of foremen at the site. Several levels of site management are routinely involved in oversight of work, including regular plant tours and cognizance of plant conditions. Management goals related to overtime, ALARA, reportable actuations and work backlogs have clear accountability. Progress towards those goals has been measured in the monthly site Vice President meetings.

Foremen and supervisors have been carefully selected, and growth potential is evident in maintenance organizations by promotions throughout the period. A culture of accountability exists, in part, because of healthy organizational relations with other work groups. The reorganization at the end of the period strengthened maintenance groups on site, by better integrating the previously sound technical support functions, and has improved morale due to assignment of the former Manager of the Maintenance Division as Station Manager. A self-assessment was conducted towards the end of the period and action plans to improve various programs were underway.

Predictive programs were better developed as new technology (thermography) and existing techniques (vibration analysis) were factored into a performance group formalized during the last half of the period. The group utilizes a preventive maintenance (PM) coordinator and dedicated staff to assemble computerized data from testing, failure data and other sources to perform trend analysis. Limited use of the program has nonetheless identified potential problems for investigation or increased maintenance. Priority has been placed upon completing overdue PM's and maintaining a balance of preventive and corrective work as a means of assuring safe reliable operation. Also, deferred PM work has written justification and is still entered in historical records based on technical evaluation. Although the Probabilistic Risk Assessment (PRA) has been kept updated and used in limited fashion for licensing and design decisions, its potential for removal of equipment from service for PM work has not been fully explored.

Important equipment has had planned overhauls during this period and experienced good reliability as a result. A valve repacking program, including live loading for all air and motor-operated valves and manual valves with a failure history, was implemented during the refueling outage and has been successful as indicated by low unidentified leakage and few radiological hazards. Problems with RWCU pump seal failures noted in previous periods were significantly reduced as only one seal failed this period. No unplanned shutdowns were attributable to maintenance activities. However, control structure chiller availability was low and increased vendor expertise and technical coordination were required. Main condenser tube leaks and air inleakage, and circulating water system problems also challenged the plant staff this period, and a planned two-week shutdown was conducted in April 1988 to repair these and other problems.

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One measure of management's influence in this area is the high level of plant housekeeping maintained, as well as clear commitments to industrial safety. Controls on scaffolding particularly following the refueling outage were lax, but improvements were instituted to more carefully consider erection near safety equipment and to promptly remove scaffolding when work was completed. Fluid leaks are not widespread and are promptly repaired, control room and local alarm panels have few chronically annunciated conditions, and access to equipment is generally easy. A formally controlled lubrication program is strictly maintained using grease procedures and locally posted instructions on proper lubricant and fill points.

Conduct of maintenance is typified by strict adherence to procedures and a teamwork approach such as on the refueling floor during the outage. Professional courteous work relationships found throughout other work groups extend to maintenance personnel as well. Dedicated planners and licensed or Shift Technical Advisor (STA) experience within the staff ensure that work is accomplished smoothly. Self-critiques are regularly conducted using videotapes and involve appropriate craft and management. The licensee has recognized the continuing challenge of making the HP-maintenance worker interface successful. Detailed workmanship and attention is evident in the more challenging jobs performed.

Procedures have been technically sound, but need better human factors and conciseness. Improvements were being undertaken for clarity, usability and incorporation of computer-drawn sketches, diagrams and pictures. Site management has recognized this problem. They are solving it by craft/foreman feedback in critiques and validation of procedures using mockups. One reportable event was attributed to a procedual inadequacy in this area.

An effective automated system (CHAMPS) enables better management and knowledge of job status at any time. A complex but well understood administrative procedure governs work. Accurate controlling documents (maintenance request forms) allow for easily understood post maintenance testing and comprehensive maintenance history. A very low backlog of work is maintained. Backlog statistics are refined to a number of meaningful measures such as: high priority non-outage workable corrective jobs older than 60 days and total number of jobs completed but not yet entered to history older than three to six months. In the latter category, an NRC violation resulted in a more challenging goal and better equipment history available at the end of the period. Trend analysis of this history identified a high failure rate for feedwater minimum flow recirculation valves which were repaired during the April 1988 outage.

Staffing was improved by consolidation of maintenance groups as part of the corporate the reorganization. The licensee supports a program to train high school graduates to be technicians, including formal education towards a two-year college associate degree and an 18 month plant systems course. Training is closely coordinated with craft/supervisor feedback and supported by a site maintenance training representative. Special courses have been devised and plant specific mockups are effectively employed.

Supervision and control of contractor maintenance is a recognized problem, as evident in the undervessel damage incurred during the CRD rebuilds and by QA audits of selected outage jobs. The licensee has already taken steps towards improving contractor workmanship by appointing a dedicated licensee foreman for outage undervessel work, a supervisory engineer for reactor work during refueling, and better screening and training of contractors.

Summary

In summary, several levels of management are effectively involved in maintenance; equipment reliability has been excellent; maintenance groups are well staffed, trained, and supported; teamwork and accountability are evident; and self-assessments and root cause analysis programs are maintaining a high quality program. Outage demands and technical problems were successfully met and solved. Repetitive failures rarely occur but nonetheless are quickly recognized and presented to management for solution. Maintenance personnel follow procedures, include pre-job ALARA-conscious decisions, and respond capably to contingencies. Work planning is

extensive and better predictive capability is being developed. Improvements are underway to make maintenance procedures more usable, better control contract work, and manage work backlogs.

Conclusion

Category 1

Board Recommendations

None

D. Surveillance (549 hours; 14%)

Analysis

Surveillance was rated Category 1 during the previous assessment. Testing successfully confirmed operability and identified equipment problems, and benefited from involved supervision and good engineering support. Relatively few instances of missed tests occurred.

During this assessment period the success of the programs depended upon strong accountability to a surveillance test coordinator. Test philosophy extends beyond compliance, including routine tests not required by technical specifications but important for safety system availability. However, the number of reportable events attributed to personnel errors continued at approximately the same rate and there were no reactor scrams caused by testing. Problems from previous assessments were significantly reduced such as instrument valving errors, missed fire watches, reactor water cleanup system isolations and difficulties with toxic gas analyzers.

Surveillance Testing continues to be effective in identifying equipment problems, especially with the emergence of performance monitoring to trend equipment reliability and allow early prediction of failures. A performance monitoring group was established with dedicated staff in the technical engineering group. Trending is also reported routinely to the PORC. Another useful trending initiative is the plant electronic notebook system (PENS) which involves computerized data entry from the daily surveillance log.

Staffing was sufficient to support surveillance testing as reflected by strict adherence to test schedules and the ability to find problems. Although half of the I&C technician staff are contractors, these personnel have been at Limerick since preoperational testing and exhibit good understanding and respect for station administrative controls.

The licensee's sensitivity to scram potential is demonstrated by an A-day/B-day logic channel test schedule: coded into the computerized scheduling system and incorporated in administrative procedures; stamped in red on procedures; and posted in the main control and auxiliary equipment rooms. This disciplined approach to testing is used to prevent coincident logic actuations and demonstrates good control over testing.

The conduct of testing is founded on effective communications and professional working relationships between test personnel and licensed operators. Technical staff are assigned as test directors and a licensed operator is routinely dedicated to complex testing such as safeguards bus logic. This was evident during extensive modification testing during the refueling outage. Inservice Testing (IST) is similarly well-coordinated. Some management deficiencies

were noted with the Containment Integrated Leak Rate Test (CILRT) involving overuse of tags, an extensively revised procedure, building access control, and communications with operators.

Areas where room for improvement exists are QC witnessing of routine testing, and the control of temporary procedure changes. Also, the daily surveillance log performed by operators to fulfill channel checks failed (over two shifts) because of an unspecified normal range to detect reversed thermocouple leads on a temperature monitor that had been improperly restored following a surveillance.

A key aspect of programs is the computer based scheduling system maintained by a dedicated test coordinator. Overdue tests are quickly identified, as in one case where planning for weekend work loads identified an incorrect test date. The master test schedule is routinely checked by station supervision and plant management, and has enabled recognition of problems. This planning enables good management of an extensive test program.

Test procedures have proved to be usable, and were recently revised with consistent human factor improvements. Independent verification following testing is sound and successful, and provides a true independent validation with a high degree of confidence in system configuration. An exception was reported in LER 88-01 involving undetected reversal of thermocouple leads. Test procedures implicitly allow for sound communications between test personnel and control room operating staff, including a pretest briefing on expected alarms and the impact on system operability. A consistent technician approach is to suspend test activity when a procedural error or equipment discrepancy is found until the problem can be resolved.

The licensee has created an atmosphere wherein personnel routinely exhibit attention to detail and involve their supervision when activities are in question. Color coded instrument cabinets in the auxiliary equipment room have reduced the potential for human error associated with divisionalized testing. The licensee minimized the use of lifted leads during testing and has virtually eliminated inaccessible test points. Station management has communicated to work groups that activities should be conducted with the idea of eliminating system challenges.

Improved communications between test personnel and operators, development and use of procedures that comply with human factors guidelines, involvement of first line-supervision, and routine use of root cause analysis programs indicate a desire to find and correct problems. Corrective action programs are persistent, as indicated by frequent revisions to LERs to describe additional information uncovered by investigations.

Certification training during this assessment period has been effective in plant staff and management understanding of the operation of plant systems. Training during the period on human performance evaluation techniques has been applied to a limited extent to the surveillance test program to effect simple but effective solutions. Less formal training has also been influential as evidenced by creation of a shift superintendent update notebook to describe ongoing technical issues.

Much of the quality oversight of surveillance is accomplished in PORC meetings. A plant incident tracking system has been effective in focusing on the more safety significant issues that occur from day-to-day. The licensee's QA and QC involvement in surveillance testing has been minimal, and has not provided assurance of the effectiveness in activities in areas such as independent verifications.

Summary

Management's oversight of testing has been strong. Clear accountability for testing performance is ensured by the scheduling program. Workers and technicians exhibit attention to detail and have the benefit of dedicated technical support, including new developments in trending. The licensee has demonstrated an aggressive approach to testing beyond mere compliance with requirements.

Conclusion

Category 1

Board Recommendations

None

E. Engineering/Technical Support (958 hours, 24%)

Analysis

This area was rated as Category 1 during the last assessment with strengths in the integration of technical expertise among all site work groups, valuable contributions from test and field engineers, and responsive professional interaction with corporate engineering.

Considerable inspection effort was devoted to this area this period, including team inspection of the environmental qualification program and assessments of the interface between site technical organizations and corporate engineering. Major licensee reorganizations occurred near the end of the period, involving both corporate and site technical functions. A new Vice President devoted solely to nuclear engineering was appointed in January 1988. Personnel appeared to be generally receptive and optimistic regarding the changes.

There were two unplanned scrams from power which occurred within a month of startup from the first refueling outage and both were caused by failures of balance-of-plant equipment. The first was due to erratic moisture separator water level control attributed to instrument air valves that had not been adequately verified as open. The other scram occurred due to a ruptured control fluid line to the main turbine control valves caused by resonant vibrations resulting from a modification. The licensee displayed a sensitivity to scram potential by restricting the unit to 85% power for two months until a solution to the vibrations could be achieved.

Site engineering support for the inservice testing (IST) of pumps and valves was found to be well coordinated, staffed with technically competent personnel and had a high degree of site management involvement. The IST organization was a knowledgeable cohesive group that closely interfaced with their maintenance department counterparts. Site engineering interfaced with corporate engineering and requested their assistance when needed. However, corporate engineering guidance appeared to be lacking and did not appear to thoroughly evaluate some issues. Examples included programmatic deficiencies with document control, ill-defined organizational and personnel responsibilities, and discrepancies between the licensee's criteria and ASME Code Section XI. In response to past engineering support deficiencies, corporate engineering is presently taking the lead in efforts to improve IST based on NRC findings at Peach Bottom.

A special fire protection inspection in response to the licensee's identified issue that an Appendix R postulated fire in the service water pipe tunnel area could disable all four emergency diesel generators (EDGs), resulted in escalated enforcement. Although an associated problem involving a deficiency in the EDG time delay setting was identified by the licensee as early as June 1984, the

lack of separation of fire protection circuitry was not identified by the licensee until October 1987. This was an indication that management attention may have been lacking. Prior evaluations and reporting involving interaction between safety and non-safety related systems may also have been inadequate. Considerable NRC effort was required to bring the problems to the surface. Once the Appendix R problem was identified, the circuitry was promptly corrected.

Another identified weakness in corporate engineering support to the site was found during audit of the environmental qualification (EQ) program. Procedures adequately documented EQ packages, and were generally well organized, however, some packages were not updated on time resulting in three violations in the qualification of Rockbestos cable. EQ maintenance and plant modification activities at the site were found to be well supported. Established EQ related training exists for individuals performing installation, modification, repair, maintenance and procurement. Personnel have also participated in EQ associated courses sponsored by industry and institutions. Personnel were aware of regulatory requirements and of the licensee's commitments to implement a fundamentally sound EQ program.

The NRC team evaluation of Unit 1 restart from the refueling outage identified a weakness with the liberal use of temporary circuit alterations (TCAs) to implement short-term modifications. Although a past-identified issue, significant numbers of outstanding TCAs existed throughout the period, many dating back to original fuel load over three years ago. Application of TCAs had doubled over each of the past three years, with approximately 25% not restored or permanently modified. While corporate engineering provided timely engineered design packages to support major refueling outage license condition modifications, the increasing number of TCAs indicated an inability to support routine plant operation. In the latter half of the assessment period the licensee initiated corrective action to reduce the number of TCAs and assign high priorities to design engineering for those TCAs (two thirds of total) awaiting permanent modifications.

Reportable issues identified during the period pointed to engineering or technical difficulties requiring more aggressive corrective action, such as the inordinately large number of secondary containment isolations. While various root causes could be assigned to these, the overriding issue involves blocking and tagging errors due to lack of identification of instrument air lines. This problem was also the apparent cause of a scram in September 1987. Site technical engineers completed an exhaustive walkdown of accessible air lines by the end of the period. This concern was also raised by the Nuclear Review Board but longer term solutions are still forthcoming. Past chronic reportable events involving chlorine and toxic gas detectors received considerable technical attention. The toxic gas detector problems were effectively addressed by logic changes and responsive engineering; however, the chlorine detector problems persist and an

engineering solution has been delayed. In certain other events (e.g. LER 87-42 regarding RPS relays) the licensee demonstrated a philosophy to go beyond mere compliance with requirements in pursuit of the root cause.

Planning and technical support were excellent for the refueling outage. Staffing in health physics, QA and QC were increased, assuring better outage coverage, including detailed audits for license conditions. Management concern for reactor safety was evident by establishment of a refueling floor outage organization with well defined lines of communication and by certain outage conservatisms including the NRB's concern to assure backup decay heat removal using fuel pool cooling systems during planned modifications to emergency service water systems. Although management's decision to secure ventilation systems on the refueling floor in August during hot humid weather necessary to tie-in standby gas treatment caused worker heat stress problems and some ALARA concerns (see section III.B), that philosophy was abandoned and contingencies were employed after worker feedback was received. The licensee successfully employed a modification coordinator similar to test coordinators for complex surveillances described in section III.C) for critically complicated changes, such as the SBGT tie-in, which involved many work groups.

A high degree of technical and management support of the ISI Program was evidenced by the use of the General Electric Company "Smart UT" which is an advanced system for recording and processing ultrasonic examination data, and by comprehensive QA coverage of ISI activities. The ISI Program is adequately staffed with well trained personnel. QA staff responsible for ISI are knowledgeable and competent to monitor these activities.

The licensee has maintained an up-to-date PRA, primarily in anticipation of Unit 2 licensing questions. However, extensive use of the study where it could seemingly contribute to Unit 1 operating decisions such as preventive maintenance and modifications has not been made. Certain Unit 2 milestones such as tie-in of service water systems (particularly for diesel preoperational testing) have been well planned and were presented to the NRC in advance of dual unit operation. Also, engineering solutions to past problems such as FASS reliability and interunit contamination of shared systems have been effectively resolved and applied to Unit 2 as well.

Summary

In summary, although engineering and technical support for the first refueling outage modifications was generally good, corporate support in resolving some chronic operational problems associated with chlorine detectors and in addressing specialized areas such as EDG fire protection instrumentation and environmental qualification left considerable room for improvement. Thus while long term preplanned support for outage activities was effective, corporate support for routine operating activities was not always so.

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Near the end of this evaluation period an increase in iodine activity in the coolant was identified as due to leaking fuel. Heat flux restrictions to minimize further fuel degradation have caused a power derating of the plant. Although the cause of the leakage has not been fully determined, a synergistic effect of zirconium cladding fabrication variations and copper and iron impurities in the feedwater may be responsible however, it is unusual for this to result in cladding failure early in the life of the plant. The response, including corrective action, taken in response to this event will be significant in the longer term operation of the plant.

Conclusion

Category 2

Board Recommendations

Licensee: Meet with NRC to review the status of the identification of the root cause of the fuel leak and the corrective actions being taken.

NRC: Increase attention to assure that licensee response to the fuel leak is comprehensive

F. Emergency Preparedness (121 hours; 3%)

Analysis

During the previous assessment period, licensee performance in this area was rated Category 1. This was based upon good exercise performance and the licensee's own initiatives in routine emergency preparedness activities.

During the current assessment period, one routine safety inspection was conducted, one full-participation emergency exercise was observed, and changes to emergency plans and implementing procedures were reviewed.

During the routine inspection performed in January 1988, several significant areas of concern were identified. Deficiencies were found in programmatic areas such as the ability to resolve exercise critique items, implementing procedure revisions, performance of related tests, and training of off site response personnel. NRC review of licensee audit results revealed that some of these areas were previously identified as deficient and in need of correction. The open item tracking system used by the licensee Emergency Preparedness Section identifies significant program deficiencies outstanding for approximately two to three years that have not received appropriate management attention and evaluation. Although many of the individual deficiencies were not of major significance a violation was issued for the licensee's failure to take corrective action on outstanding Emergency Preparedness Program deficiencies identified by their own audit program.

The audits of the Emergency Plan, Emergency Plan Procedures, and Corporate Procedures noted in the preceding paragraph have been conducted by the corporate organization with contractor support every 12 months. These audits were performed in adequate detail to provide assurance that potential weaknesses were identified and discussed with emergency preparedness management. However, two separate 1986 independent audits were performed which identified recurrent program deficiencies. The results of both audits were sent to the Director, Emergency Preparedness. No action was taken by the corporate Emergency Preparedness staff or other management to correct these identified deficiencies. This led to an NRC finding that formal distribution of the 1986 audit results to appropriate plant or corporate management was not made. In the licensee's 1987 QA audit report several new findings were identified in addition to recurring program deficiencies, which indicates an inadequate response to self identified problems. Deficiencies associated with program management and the independent review process remained unresolved, an Action Item Management Team was established to address these concerns.

During the unannounced, full-participation exercise held on April 5, 1988, the licensee's execution and participation demonstrated acceptable planning and thorough accident management. The NRC team observed several minor performance weaknesses in the areas of information flow, use of Emergency Plan Procedures (EPP), and training of personnel to effectively carry out EPP's. The licensee also demonstrated adequate corrective action for previously identified NRC exercise items through appropriate program changes and retraining.

The level of staffing and resources maintaining the Emergency Preparedness program is strained and the effectiveness of the Site Emergency Preparedness Coordinator (SEPC) in completing task assignments has suffered as a result. Scenario development and review via contract support has been acceptable. The Director, Emergency Preparedness was also overburdened in that oversight responsibility for program administration, on site planning support, off site planning support, and drill/exercise conduct must be implemented at both the Limerick and Peach Bottom sites. Near the end of the SALP period the licensee implemented management changes and also dedicated additional corporate support to the Emergency Preparedness program; however the effectivness of these improvements have not yet been assessed by the NRC.

Emergency Response Facilities (ERF) are dedicated and have been adequately maintained throughout the period.

Summary

In summary there appears to be adequate ability to respond to emergencies, however, it appears that the strong interface exhibited in previous assessments between the corporate emergency preparedness staff and the SEPC/site support staff has been weakened. Responsibility for assignment and completion of site duties is assumed by the SEPC without adequate resources or direction from the corporate staff.

Conclusion

Category 2

Board Recommendations

Licensee

1. Focus additional attention on resolving outstanding audit findings and institute more timely corrective action for them.

2. Ensure effective completion of required Emergency Preparedness Program tasks, including planned corrective action resulting from identified deficiencies.

G. Security and Safeguards (281 hours, 7%)

Analysis

During the previous assessment period, this area was rated category 2. The licensee and the security force contractor aggressively pursued a planned course of action to identify and correct the root causes of their identified poor performance and implemented many changes in an effort to improve the overall security program.

Those changes included a significant increase, on the part of the licensee, in program oversight and direction, management involvement and support, and training program enhancements.

A high degree of licensee management attention to and involvement in the program continued to be evident during this assessment period and was matched to a substantial degree by the licensee's security contractor. This combined effort to establish and maintain an effective and high quality security program resulted in excellent performance throughout the period (one minor violation), in addition to further program enhancements.

The additional enhancements included: (1) establishing a Security Incident Review Committee composed of operations and security management personnel, to evaluate all security events for plant safety and security consequences; (2) providing proprietary shift supervisors specialized training in alarm station operations, audits, surveillance testing techniques, and emergency preparedness; and (3) developing an action plan and tracking system to provide for a smooth integration of Unit 2 systems and equipment into the Unit 1 program and assigning responsibility for the transition to an individual with no concurrent Unit 1 program duties. The implementation of further enhancements provide continued evidence of managements' further interest in maintaining an effective program rather than a compliance oriented program.

The licensee continued to use a self-appraisal program to monitor the on-going performance of the security force and to identify potential problems easily and correct them effectively. The responsibility for implementing this program was reassigned from the security contractor to the licensee's proprietary supervisors during this period. The self-appraisal program combined with other security program audits and surveillances, and the NRC required annual program review, is believed by NRC, to be a significant factor in improving the security program and is indicative of the licensee's desire to achieve high quality in its program implementation. This was also apparent by the licensee's actions in response to generic Regulatory Effectiveness Review findings. In that regard, the licensee, on its own initiative, actively pursued the generic findings at the Limerick Generating Station to determine if any similar deficiencies existed and, as appropriate, promptly corrected potential problems.

The licensee's security contract also continued to make enhancements to its portion of the program. These included: (1) improving the established security force training program by refining lesson plans and obtaining additional training aids; (2) providing additional emergency preparedness task training (3) renovating the equipment and arms room and revising arms issue procedures; (4) developing a pool of trained and qualified supervisory personnel to provide an effective line of succession; and (5) developing and implementing on-post security task certifications. In addition, the contractor exerted a commendable effort to improve employment benefits and human factors for the guard force in order to strengthen morale.

Security management involvement in industry and NRC initiatives involving nuclear power plant security progressed throughout the period in response to identified problems, [illegible]onstrating management support of the program. In addition, the [illegible]see has taken very aggressive measures to reinforce its Fit[illegible] for Duty Policy and to achieve a drug free work place for per[illegible] at the Limerick Generating Station. On several occas[illegible] during the period, the licensee conducted drug sweeps of t[illegible]tion using specially trained dogs, pursued in-depth investigati[illegible] alleged drug related activities, provided special dru[illegible]eness training sessions for supervisory personnel, and enfo[illegible] appropriate disciplinary actions for offenders. The licensee'[illegible]tiatives in this regard are exemplary and demonstrate a [illegible]responsible position to ensure public health and safety.

The training program is [illegible]mented by well-qualified and experienced instructo[illegible] no concurrent duties. Facilities and equipment are adequa[illegible] lesson plans are well developed and kept current through va[illegible]edback mechanisms, including the self-assessment and on[illegible] task certification programs. The initiatives implemented duri[illegible] previous assessment period, particularly the revisions to p[illegible]ures and post instructions to make them clear and concise, were [illegible]ently effective as indicated by the relatively small numbe[illegible] guard force personnel errors.

Staffing of the proprietary and contractor organization is effective as evidenced by the effective oversight and excellent performance during the period. Staffing of the guard force also appears to be sufficient as indicated by the limited use of overtime. This is also considered by the NRC, to be a significant factor in improving the program and indicative of the licensee's desire to achieve high quality in program implementation.

The licensee's event reporting procedures were found to be clear and consistent with the NRC's new reporting requirements. Seven event reports were submitted to the NRC during the period. Four of the reports resulted from the licensee's follow-up of drug related activities; one involved an inattentive guard; another resulted from a computer failure, and the seventh resulted from the detection of a

SEE ERRATA SHEET AND AMENDED PAGE

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The training program is implemented by well-qualified and experienced instructors with no concurrent duties. Facilities and equipment are adequate and lesson plans are well developed and kept current through various feedback mechanisms, including the self-assessment and on-post task certification programs. The initiatives implemented during the previous assessment period, particularly the revisions to procedures and post instructions to make them clear and concise, were apparently effective as indicated by the relatively small number of guard force personnel errors.

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weapon at a protected area access control point. Each report was clear and concise, and indicated appropriate response to the reported event.

During the assessment period, the licensee submitted two revisions to the security plan under the provisions of 10 CFR 50.54(p). The licensee's corporate security staff is responsible for ensuring that plans are current and for coordinating changes, when required. The licensee's staff is very effective in carrying out this responsibility. They often communicate and review changes with the NRC to ensure a clear understanding. When the plan changes are submitted to NRC, they are of good quality, which is indicative of a thorough review and a comprehensive understanding of NRC security performance objectives.

Summary

In summary, the licensee and its security contractor continued to strive for an effective and high quality program throughout the period. Significant improvements were made to the program and these resulted in excellent performance and implementation of a security program that is oriented toward meeting the NRC's nuclear plant security objectives rather than merely regulatory compliance. The efforts expended during this period (and the preceding period) are commendable and demonstrate the licensee's ability to turn a marginal program into a high quality program through management involvement, attention and oversight.

Conclusion

Category 1

Board Recommendations

Licensee: Continue initiatives to further enhance program.

H. Safety Assessment/Quality Verification

Analysis

Assurance of quality has been considered as a separate functional area in past SALPs, in addition to being one of the evaluation criteria in functional areas, and was rated as Category 1. This area has been expanded to encompass activities previously evaluated in Licensing, including safety evaluations. This discussion is a synopsis of quality and safety evaluation philosophies reflected in other functional areas. In assessing this area, the SALP Board has considered attributes which are key contributors in assuring safety and verifying quality. Implementation of management goals, planning of routine activities, worker enthusiasm, management involvement, and training are examples.

The previous SALP noted that the licensee had demonstrated considerable technical capability and evidence of management involvement in licensing activities. The weakness noted was the quality of the no significant hazards determinations (NSHDs) associated with license amendment applications. The SALP Board recommended monthly meetings between the licensee and NRC staff, which have been held.

During this SALP period, management took an active role in resolution of any problems and ensured that schedules were met without sacrificing quality. There was a noted improvement in the thoroughness and scope of the NSHDs. There are only four multi-plant generic issues remaining to be closed on Limerick 1 and these are nearing resolutions.

Licensee management has upgraded training programs for the licensing staff and arranged for the personnel to spend more time onsite. Licensing activities are conducted by a well staffed and well trained group. Management overview is evident as warranted.

The Plant Operations Review Committee (PORC) continues to be forceful in maintaining safe operation. Use of a sub-PORC process keeps the focus of the full committee on significant safety issues. Use of a specially devised PORC process whenever operational conditions change has insured that no problems remain unaddressed prior to startup; however, more visible involvement by the ISEG and QA in that process is warranted. Routine meetings are reflected by excellent written minutes that provide a good reference for station performance. The value of PORC safety decisions is a result of the professional meeting atmosphere developed by past station managers and continued under the strong leadership of the Superintendent of Operations.

The licensee conveys quality messages to workers in relatively simple ways. Signs are evident throughout the plant underscoring the importance to safety of routine tasks, including quality and

excellence banners. Station manager memoranda to site personnel commend them for a job well done such as the outage, or serve as reminders for careful work practices such as fire doors.

Management and corporate involvement with worker exposure programs was still of some concern to NRC in that a Station ALARA Review Committee had never formally met until NRC concerns were raised. However, dissemination of the ALARA message to work groups was evident.

The licensee has instituted unique corrective action programs which are sufficiently self-critical to prevent recurrence and get at the root cause of problems. An example was the video tape of skits performed by operators designed to show that well-executed routine activities can significantly reduce risk and enhance safe operation.

Safety evaluations (modifications, TCAs, new procedures, and general plant issues) have been insightful and complete.

Prior to the reorganization the licensee's quality verification groups (QA/QC) were fragmented among work organizations which diluted their effectiveness at times. Some problems in communicating quality concerns to operating staff were noted. However, because of excellent work performance and the ability of work groups to find and correct their own problems, QA/QC has not been an essential ingredient in assuring operating excellence. Quality group involvement in certain areas such as surveillance testing has been minimal, and has not allowed for an even assurance of activities such as independent verifications. Quality auditors and inspectors are generally well qualified and very conscientious as reflected in audits which were detailed and critical of activities such as emergency preparedness, fire protection, and maintenance.

As discussed in Section IV.D, technician qualifications and involvement of first-line supervision have resulted in high quality test programs. Supervision's attention to detail has been instrumental in effectively getting to root cause and preventing problems from recurring.

The Nuclear Review Board (NRB) was reconstituted at the beginning of this period, including the addition of three senior consultants. The Board has progressed to a more thoughtful diagnosis of problems, as evidenced by focus on issues during the refueling outage concerning decay heat removal and the increased number of personnel contaminations. All of the licensee's shift superintendents have had an opportunity to address the NRB in a full meeting on topics ranging from Peach Bottom feedback to the selection process for promotions. The NRB has also expressed increased awareness for the effect of Unit 2 preoperational test preparations.

Corrective action programs are portrayed by the quality of LERs, with the exception of design problems manifest in secondary containment isolations and chlorine detectors. Past events due to instrument valving errors, missed fire watches, and safety system actuations have been eliminated. The detail presented in LERs has been excellent, reflecting the strong technical expertise of the staff. Although increasing trends for LERs have been noted, such as during the refueling outage, the licensee properly interpreted those trends. Some late LERs and the practice of extending them by supplements to provide all required information suggest a management weakness in the utility's Licensing organization. Corrective actions in response to recurrent licensee identified deficiencies in the Emergency Preparedness Program were unnecessarily delayed because of a lack of corporate management oversight and of a lack of line management accountability for program audit findings.

The licensee's initiatives in the area of fitness for duty have been progressive, employing competent onsite security investigators, using drug dogs as an effective deterrent, instituting policies for drug screening of contract organizations, and maintaining consistent communications with the NRC regarding fitness for duty issues. The licensee has sent a clear message to all site employees regarding expected levels of fitness for duty.

Summary

Quality programs at Limerick have, in an integrated fashion, fostered a healthy working atmosphere. Programs have sufficient overlap and depth such that there is high assurance that undetected errors are rare. Site management prevents significant problems by early detection and unique resolution such that recurrences are infrequent. The preponderant cultural attitude is one of sensitivity to people, and has allowed for the plant to survive difficult reorganizational phases and other high expectations in light of questions regarding Peach Bottom. The leadership of superintendents and front-line supervisors, and the management which is an out-fall from the PORC, have been instrumental in assuring quality.

Conclusion

Category 1

Board Recommendations

None

V. SUPPORTING DATA AND SUMMARIES

A. Investigations and Allegations

No NRC Office of Investigations reviews were conducted during the assessment period.

Three allegations of drug use by contract personnel during this period resulted in the discharge of several workers when drug tests confirmed the information or when they refused to submit to a test. A forth drug allegation could not be pursued due to inadequate information from an anonymous source.

B. Escalated Enforcement Actions

Level III violation (no civil penalty) for Appendix R diesel fire flow switch design.

C. Management Conferences

On July 7, 1987, the licensee met with NRC management on site to discuss the previous SALP report findings.

On October 8, 1987, licensee engineering representatives met with NRC Region I personnel in King of Prussia to discuss the technical aspects relating to flow switches in the fire suppression system which could have affected diesel generator operability.

On October 22, 1987, an enforcement conference was held at the NRC Region I office in King of Prussia to discuss a violation of 10 CFR 50, Appendix R requirements involving the diesel generator flow switch cable routing.

D. Licensee Event Reports (LER)

1. Report Quality

Utilizing the basic evaluation methodology presented in NUREG-1022, Supplement 2, overall quality of licensee event reports (LERs) is very good. A strong point for Limerick LERs continues to be the in-depth discussion of failure and root cause. There has been improvement in the identification of previous occurrences. There has also been improvement in the safety assessment discussions, but this is an area which would benefit from added attention. The licensee routinely supplements LERs with additional findings and has a good practice of using diagrams where appropriate. While reviewing 82 LERs this assessment period, clarification was only needed on several occasions by the staff. However, in several instances LERs were late.

2. Causal Analysis

		Number	Percent
A.	Personnel Error	32	39
B.	Design/Manuf./Constr./Install.	21	26
C.	External Cause	0	-
D.	Procedure Inadequacy	8	10
E.	Component Failure	12	15
X.	Other (incl. unknown)	9	10
	TOTAL	82 Events	100

A tabulation of LERs by functional area is attached as Table 3.

- LER Nos. 86-57, 87-01 to 87-70, and 88-01 to 88-11 were received and reviewed by the NRC during the assessment period.

- The 82 LERs which were reported during the assessment period were also subject to an ongoing review as part of NRC inspections for trends and root cause identification. The following sets of common mode events were identified:

a. Thirty-two LERs were attributed to personnel error. (Approximately 26 on an annualized basis.) These LERs accounted for approximately 40% of the events reported as was the case during the previous assessment period.

As shown in the following table the refueling outage period accounted for a significant percentage (56%) of the total number of personnel error LERs. For the periods outside of the outage, there appears to be a gradually improving trend in the number of personnel error LERs as well as the percentage of the total.

Time Frame (Quarterly)	Personnel Error LERs	% of Total
Feb 1-Apr 30, 1987	4	31
May 1-Jul 31, 1987	14	56
Aug 1-Oct 31, 1987	9	39
Nov 1, 1987-Jan 31, 1988	3	25
Feb 1-Apr 30, 1988	2	22
May 15-Aug 26, 1987 (Refueling Outage)	18	60

A different breakdown of the personnel errors indicates that approximately 62% were partially or wholly a result of inattention to detail, whereas a lack of knowledge necessary to complete a specific task or poor judgement were primary factors in 25% and 13%, respectively, of the remaining LERs.

Increased management attention to personnel errors as a result of the significant increase during the outage appears to have been effective.

b. Twenty-one LERs were attributed to design, manufacturing, construction or installation problems. Of these, five were again a result of the sensitivity of the control room chlorine detectors to moisture and the fact that one of two instruments will initiate a control room isolation. Further modifications were planned to revise the system logic so that spurious signals on one instrument will not cause an isolation, although this has been a chronic problem.

The remaining LERs were the result of various problems however, there did not appear to be any common cause or programmatic deficiencies evident.

c. LER 87-47 was attributed to an external cause in that a control room isolation occurred in response to apparently higher than normal chlorine levels in the atmosphere however the source of the chlorine could not be identified.

d. Eight LERs were a result of procedural deficiencies. On an annualized basis this represents an approximate 20% reduction from the previous assessment period and maintains a downward trend noted in the previous SALP. A detailed review of the eight LERs did not reveal any cause for concern that a systematic problem may be present in the station's procedure writing and revision programs.

e. Component failures accounted for 12 LERs during the period. This represents a negligible increase in the rate of component failures over the number experienced during the previous period. A detailed review did not indicate any maintenance program, procedure, or performance problems which may have contributed to the failures.

TABLE 1

Inspection Hours Summary

February 1, 1987 - April 30, 1988

Limerick Generating Station Unit 1

	Hours	% of Time
A. Plant Operations	1191	29
B. Radiological Controls	429	11
C. Maintenance	503	12
D. Surveillance	549	14
E. Engineering/Technical Support	958	24
F. Emergency Preparedness	121	3
G. Security and Safeguards	281	7
H. Safety Assessment/Quality Verification	*	—
TOTAL	4032	100

*Hours expended in the area of safety assessment/quality verification are included in other functional areas.

Inspection hours are the result of NRC Inspection Report Numbers 87-05 through 31, and Numbers 88-01 through 08.

Total hours represent a 15-month assessment period, and are equivalent to 3226 hours on an annualized basis. Approximately two-thirds of the total time (2650 hours) was expended by resident inspection documented in 11 reports. The other one-third of the total time (1382 hours) was expended by specialist or team inspections (EQ, EP, Restart and EOP teams) as documented in 22 reports during the assessment period.

TABLE 2

Enforcement Summary

Limerick Unit 1

2/1/87 - 4/30/88

Functional Area	Violations and Severity Level III	IV	V	Subtotal
A. Plant Operations	0	2	1	3
B. Radiological Controls	0	0	0	0
C. Maintenance	0	0	1	1
D. Surveillance	0	0	0	0
E. Engineering/Technical Support	1	4	0	5
F. Emergency Preparedness	0	2	0	2
G. Security/Safeguards	0	1	0	1
H. Safety Assessment/ Quality Verification				
TOTAL	1	9	2	12

TABLE 3

Licensee Event Reports

Limerick Unit 1

2/1/87 - 4/30/88

Functional Area	Number by Cause						Subtotal
	A	B	C	D	E	X	
A. Plant Operations	10	2	0	1	4	3	20
B. Radiological Controls	0	0	0	0	0	0	0
C. Maintenance	3	1	0	0	2	1	7
D. Surveillance	16	1	0	6	4	0	27
E. Engineering/Technical Support	3	17	0	1	2	5	28
F. Emergency Preparedness	0	0	0	0	0	0	0
G. Security/Safeguards							*
H. Safety Assessment/ Quality Verification	0	0	0	0	0	0	0
TOTALS	32	21	0	8	12	9	82

*Security Event Reports are discussed separately in Section III.G.

Causal Codes:
- A. Personnel Error
- B. Design, Manufacturing or Installation
- C. Unknown or External Cause
- D. Procedure Inadequacy
- E. Component Failure
- X. Other

As discussed in Section V.D, LER tabulations include LER Nos. 86-57, 87-01 to 70, and 88-01 to 11.

ENCLOSURE 4

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406

07 JUL 1988

Docket No. 50-352/NPF-39

Philadelphia Electric Company
ATTN: Mr. C. A. McNeill
Executive Vice President
Nuclear
2301 Market Street
Philadelphia, Pennsylvania 19101

Gentlemen:

Subject: Systematic Assessment of Licensee Performance (SALP) Board Report Number 50-352/87-99

An NRC SALP Board has reviewed and evaluated the performance of activities at the Limerick Generating Station for the period of February 1, 1987 through April 30, 1988. The results of this assessment are documented in the enclosed SALP Board Report. We will contact you soon to schedule a meeting to discuss the SALP evaluation.

At the SALP meeting you should be prepared to discuss our assessments and your plans to improve performance. The meeting is intended to be a candid dialogue wherein any comments you may have regarding our report are discussed. Additionally, you may provide written comments within 20 days after the meeting.

Your cooperation with us is appreciated.

Sincerely,

W T Russell

William T. Russell
Regional Administrator

Enclosure: SALP Board Report No. 50-352/87-99

8807110464 2pp.

07 JUL 1988

cc w/encl:
John S. Kemper, Sr., Senior Vice President - Nuclear
E. C. Kistner, Chairman, Nuclear Review Board
Graham M. Leitch, Vice President, Limerick Generating Station
J. W. Gallagher, Vice President - Nuclear Services
Troy B. Conner, Jr., Esquire
Eugene J. Bradley, Esquire, Assistant General Counsel
W. M. Alden, Director, Licensing Section
Dave Honan
K. Abraham, PAO (13)
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
Commonwealth of Pennsylvania
Chairman Zech
Commissioner Roberts
Commissioner Carr
Commissioner Rogers