

# SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE (SALP)

## PEACH BOTTOM ATOMIC POWER STATION

REPORT NO. 50-277/92-99 & 50-278/92-99

### I. BACKGROUND

The SALP Board convened on May 20, 1994, to assess the nuclear safety performance of the Peach Bottom Atomic Power Station for the period November 1, 1992, to April 30, 1994. The board was convened pursuant to U.S. Nuclear Regulatory Commission (NRC) Management Directive (MD) 8.6, "Systematic Assessment of Licensee Performance (SALP)" (see NRC Administrative Letter 93-02). Board members were James T. Wiggins (Board Chairman), Deputy Director, Division of Reactor Safety, NRC Region I (RI); Jacques P. Durr, Acting Deputy Director, Division of Reactor Projects, NRC RI; Susan F. Shankman, Deputy Director, Division of Radiation Safety and Safeguards, NRC RI; and Charles L. Miller, Director, Project Directorate I-2, NRC Office of Nuclear Reactor Regulation. The board developed this assessment for approval by the Region I Administrator.

The following performance category ratings and the assessment functional areas are defined and described in NRC MD 8.6.

### II. PERFORMANCE ANALYSIS - PLANT OPERATIONS

The Plant Operations functional area was rated a Category 2, Improving, in the previous assessment period. Throughout that period, the plant was operated in a safe and conservative manner with noted improvements in licensed operator staffing, training and qualifications. Operator and shift management responses to plant transients were excellent. Weaknesses in operator reference to, use, and adherence to procedures were observed; however, the board noted that the overall level of performance in the Operations area had improved.

During this assessment period, strong plant management oversight of daily plant operations and excellent response to events continued. This was exemplified by the appropriate safety decisions to shut down Units 2 and 3 to address various operating problems such as leaking fuel assemblies and motor-operated valve deficiencies. Also, to further increase management oversight of field activities, PECO recently instituted a management observation program that requires managers and supervisors to perform multiple plant observations each month. Refueling and forced outages were also generally well coordinated and planned.

Operator performance also continued to be a strength. The operators successfully responded to several challenges from operating transients as well as normal plant startups and shutdowns. Most notable of these events were the manual scrams operators initiated in response to equipment problems, such as the Unit 3 overheated resistor in the main generator exciter cabinet, the Unit 3 loss of condenser vacuum, and the Unit 2 problem with reactor

water level instrumentation. Shift operating personnel conducted activities professionally, exercising excellent command. Additionally, several anomalous conditions were quickly detected by alert control board operators. Equipment testing pre-briefs were thorough and communications were effective. High quality alarm response procedures were particularly noteworthy.

Further demonstration of outstanding operator performance was observed during initial license and requalification examinations. Operators were well prepared, and displayed particularly good knowledge of emergency operating procedures.

Isolated performance problems attributable to operator errors were noted earlier in the assessment cycle such as the inadvertent partial draining of the condensate storage tank to the torus, a recirculating pump runback, the mispositioning of a control rod, and the failure to reset the high pressure coolant injection pump after an initiation. While these problems were of minimal technical significance and did not exhibit a common programmatic causal factor, they did represent minor instances of inattention to detail by the operators and they warrant increased attention by the operations management.

The Independent Safety Engineering Group (ISEG), the Nuclear Review Board (NRB), and the Plant Operations Review Committee (PORC) were found to be effectively focused on safety issues. PORC was intimately involved in the Unit 3 core shroud cracking issue. Additionally, ISEG has made direct contributions to safety in areas such as shutdown risk amelioration and reactor vessel level instrumentation enhancements.

In summary, the plant operators clearly showed strong performance in dealing with operational challenges and in the routine operation of both units. They received positive direction and support from plant management who were closely involved in day to day activities, and in longer term planning for outages and refuelings. The self assessment groups of ISEG, PORC, and NRB were effective in identifying issues and problem resolution. Minor attention to detail problems were noted, warranting added operations management attention.

The Plant Operations area is rated as **Category 1**.

### **III. PERFORMANCE ANALYSIS - MAINTENANCE**

During the previous SALP period, the Maintenance functional area was rated Category 2. Organizational changes helped the Maintenance Section focus better on in-plant maintenance activity. Several major equipment upgrades were completed; however, numerous safety and non-safety related component failures occurred during the period. Problems with non-safety related and balance of plant equipment performance contributed to several transients, some resulting in reactor scrams. The quality of the maintenance planning process showed

noticeable improvement near the end of the period. Some weaknesses were noted in maintenance procedures. PECO's actions taken to address weaknesses in the surveillance testing program were effective.

During this SALP period, major maintenance and surveillance activities were well planned and executed. Aggressive site management oversight of these maintenance activities was apparent. Maintenance, operations, and engineering personnel coordinated major activities well. PECO's performance during emergency diesel generator outages was particularly strong.

PECO's Plant Information Management System (PIMS) was a positive factor in planning and scheduling maintenance tasks. The historical file capability of PIMS allowed the person developing a work order to immediately access information on previously performed related maintenance activities. Also, PECO recently initiated the "Fix It Now" process, which corrects minor maintenance issues quickly, and has already shown positive results in reducing the maintenance backlog. However, it is too early to assess the long term effectiveness of this program.

Troubleshooting and root cause analyses have been effective. For example, during the replacement of the residual heat removal system heat exchanger floating head gaskets, PECO determined that relaxation of the floating head bolt torques was the cause of the head leaks. PECO planned, pre-staged, and conducted the work in a safe and organized manner.

Equipment failures, attributed to maintenance personnel errors, resulted in two plant shutdowns. These errors were noteworthy shortcomings in the maintenance program. Inadequate preventive maintenance practices resulted in a generator field ground which contributed to a manual trip of Unit 3. Secondly, PECO failed to maintain tolerances within a low pressure coolant injection (LPCI) valve body during maintenance activities conducted during the refueling outage. This resulted in a forced shutdown of Unit 3 to repair the valve after it could not pass surveillance testing requirements.

PECO's surveillance program effectively identified component degraded conditions. For example, problems with the high pressure coolant injection system, and an emergency diesel generator failure were identified during periodic surveillance testing. Also, PECO implemented an effective monitoring program following the LPCI valve failure discussed above, which enabled them to identify and correct a subsequent degraded valve condition. Additionally, based on industry information, PECO conducted a detailed systematic inspection of the Unit 3 core shroud. This effort was appropriately expanded and controlled when initial visual inspections identified indications of cracking.

Finally, there have been multiple instances noted of failure to follow procedures or of inadequate procedures. Examples include tagging and clearance problems involving inadequate system isolation boundaries, inadequate guidance in the clearance and tagging manual on clearance control for certain conditions, and inconsistent documentation of

troubleshooting, minor rework, and testing support activities. Individually, these instances were of minor safety significance, but collectively they pose a concern as PECO's efforts to reduce the number of these occurrences have not been fully effective.

In summary, PECO's overall performance in this area continued to be good. Major work was well planned and executed. Management oversight was aggressive. PECO's troubleshooting and root cause analyses were noted strengths. However, noteworthy errors by maintenance personnel resulted in two unplanned plant shut downs. Additionally, there were continuing problems with inadequate procedures and procedure adherence.

The Maintenance area is rated as **Category 2**.

#### **IV. PERFORMANCE ANALYSIS - ENGINEERING**

The Engineering functional area was rated Category 2 in the last assessment. Strengths included corporate and site management involvement and excellent engineering shown in modification packages and in license amendment submittals. Weaknesses included problems in the motor-operated valve testing program support, in particular in the evaluation and disposition of valve deficiencies. Technical Section support and response to generic issues showed mixed performance.

This period, performance in the Engineering area improved. Site engineering management provided very good oversight and control, particularly after most engineering functions were moved to the site. The quality of engineering work products was also very good. Personnel were well qualified and contributed to the safe operation of the facility.

Site engineering management oversight of, and involvement in, engineering and operating activities were good. The NEEDS initiative moved most engineering functions to the site and has provided for increased responsibility and accountability in the site engineering organization. Engineering management fully participated in the morning site management meetings, providing for close support of the operating organization. Communication and coordination with corporate engineering were good. The backlog of engineering work was well tracked and understood within the engineering organization with modest success at reducing that backlog. Planning and scheduling activities were decentralized and performed within each engineering section; this focused responsibility for closure of engineering tasks within those sections, increasing their accountability, while at the same time providing to those sections added challenges over that presented by a more centralized control process.

PECO expanded on the classical concept of systems engineers by forming a group of system managers. In addition to tracking the status of assigned systems, the system managers have been charged with the responsibility to plan and coordinate site activities needed to improve

the overall performance and reliability of their systems. Performance of system managers in this expanded role was good, with some more successful than others in achieving management's expectations.

The engineering organization effectively dealt with the vast majority of technical issues under its purview. Modification packages and their supporting engineering bases were comprehensive and of excellent quality. For instance, modifications associated with the alternate power supply to the residual heat removal system, the hardened containment vent, the reactor water level measuring system and the station blackout tie line were of very good quality. The scope of post-modification acceptance tests was generally very good and those tests were effectively implemented. Further, engineering efforts to resolve emerging issues, such as the core shroud cracking and the response to indications of leaking fuel bundles were very good. Also, the quality of licensing submittals to the NRC was generally good.

Despite this generally effective performance, some noteworthy problems developed where the engineering organization struggled to provide the needed support. Some of these problems involved activities where corporate engineering provided for contractor-performed design work. For instance, the design and implementation of a new control room radiation monitoring system was poor; resulting in numerous problems during modification installation and testing, at the end of the period. Further, engineering was slow to identify and resolve problems with high pressure coolant injection system motor starting relays. Also, while the engineering organization performed an adequate and timely structural integrity evaluation of a leak in the emergency service water system, it was slow to request relief from the NRC to authorize the delay in completing final repairs to the system.

Performance in programmatic activities managed by the engineering organization was also good. The erosion/corrosion program was effectively designed and capably implemented. There were generally effective controls on PECO's initiatives to incorporate digital controls technology into both units, removing older problem controllers. Further, self-assessment programs contributed to overall engineering performance.

Engineering personnel were knowledgeable in both their engineering discipline and the plants. PECO started to see the benefits of locating the bulk of its engineering talent at the site. One exception found early in the period involved the extent of knowledge of site engineering personnel in those areas key to supporting the transition to digital control systems. PECO addressed that weakness during the period.

In summary, performance of the site engineering organization was very good. Management oversight and controls were generally effective in assuring an appropriate level of support to the operating organization. Technical work was, in general, of high quality. Programmatic activities were effective and engineering personnel effectively contributed to operational safety. However, some noteworthy weaknesses were found in certain modification activities

and in the resolution of some technical issues. Further, some initial problems existed involving the knowledge level of engineering personnel involved with digital controls technology that were addressed during the period.

The Engineering area is rated as **Category 2**.

## **V. PERFORMANCE ANALYSIS - PLANT SUPPORT**

This functional area is new, representing a significant change from the previous SALP process. The Plant Support functional area covers all activities related to radiological controls, chemistry, emergency preparedness, security, fire protection, and housekeeping controls.

In the previous SALP report, Emergency Preparedness (EP) and Security were rated as Category 1 while Radiological Controls was rated as Category 2. Strengths that were noted in the emergency preparedness area included significant management involvement as demonstrated by selection of a highly-qualified program supervisor and the expenditure of significant resources in building and equipping a state-of-the-art emergency operations and public information facility for use in an emergency. Effective personnel training was demonstrated during five events and during NRC administered walk-through examinations. In the security area, strengths were noted in staffing, plant and security management interface, and audits and self-assessments. Management involvement and a performance-based program were also identified as strengths. While the effectiveness of radiological controls was good, some weaknesses existed in radiation work practices and in dealing with non-routine work. Strengths included management oversight in effluent controls, environmental monitoring and measurements. Fire protection, housekeeping and effluent monitoring were not separately evaluated, but were included in other functional area assessments.

During this SALP period, the overall performance in this functional area was generally strong. Management attention and support continued and resulted in improvements in the "as low as reasonably achievable" (ALARA) program, health physics instrumentation, station housekeeping, emergency response program, emergency response facilities and equipment, and in the security program. Recently, supervisors and managers were required to perform multiple plant observations each month to maintain effective oversight of work activities and to reinforce management expectations.

Effective training programs were evident in the generally excellent performance of health physics personnel. There were few personnel errors and a significant reduction in personnel contaminations. Radiological control technicians were proactive and aggressive in enforcing good radiation worker practices and in controlling contamination. Chemistry personnel were

knowledgeable of and well qualified in the radioactive liquid and gaseous effluent control programs and were able to effect a fifty-percent reduction in the frequency and concentrations of liquid releases.

Comprehensive, in-depth audits, which included individuals with appropriate technical expertise on the auditing teams, and routine self-assessments were conducted and continue to strengthen the programs in this area. Increased management involvement in the ALARA program was evident by efforts to reduce source terms. For example, emphasis was placed on reducing outage time by carefully planning work, suspected degraded Unit 2 fuel was removed from the core, a cobalt reduction program was formalized, a study to minimize plate-out on condenser tubes was initiated, and a primary piping radiation reduction study was continued. Additionally, each department was tasked to develop exposure reduction plans.

In the emergency preparedness program, continued excellent performance was enhanced by completion of a major renovation to the Technical Support Center that resulted in an outstanding modern facility, and by improvement of the Operations Support Center. Additionally, a new siren system was installed that enhanced monitoring and control, and enhancements were made to increase the effectiveness of field monitoring teams and callout capabilities. Performance in the partial participation annual exercise was very good with no exercise weaknesses identified.

The effectiveness of the security program continued to be excellent. Management attention and involvement continued at a high level, as evidenced by further program improvements and enhancements. These improvements and enhancements included a new vehicle access to enhance processing, installation of new assessment equipment in the Secondary Alarm Station and installation of new intrusion detection equipment in a perimeter protection zone.

Increased plant management focus on general and radiological housekeeping in the plants occurred during this SALP period, and, through such efforts as the monthly clean-up day, yielded considerable improvement in the appearance of the station and better contamination control. One example of these good housekeeping practices was the actions taken during preparation for a hurricane in which storage areas were cleaned up and loose articles were removed from around the plants; however, some station areas still need attention. Additionally, while worker participation in the ALARA program was evident, site management attention is still needed to encourage more proactive participation. Management acknowledged that additional emphasis was needed and would be provided to further improve housekeeping, contamination control practices, and radiation worker participation in the ALARA program.

A new tracking system in which corrective actions have been broadened in scope, resulted in a reduction of recurring problems. For example, early in the SALP period, several instances of plant systems reconfiguration by operators caused changes in ambient radiation fields in the plant. The Radiation Controls Department was not forewarned of these reconfigurations.

When the new tracking system identified this as a recurring problem, the corrective action initiated was a review of each operations procedure to identify where cautionary notes were needed to ensure that proper notifications were made before system reconfiguration in the future. That effort is on-going and appears to be highly effective.

Several program implementation weaknesses were identified. Most notable was the failure of radiation workers to meet management expectations regarding adherence to radiation work practices. This is of particular concern to the NRC since it is a weakness identified during the last SALP period. Examples of this occurred in the middle of this SALP period when, on three separate occasions, plant workers rationalized the potential radiological safety consequences of their actions, rather than deferring such decisions to those personnel trained and experienced in dealing with such hazards. In two cases, the transgression was detected by a radiological controls technician. The NRC recognized that station management took aggressive action; however, it is important that management ensure that expectations, with respect to adherence to accepted station practices, are clear to all workers. A recent example of the need for management vigilance was the incident in which chemistry department workers responsible for collecting composite samples (used to monitor the radiological environmental condition of river water) did not adhere to station procedures, and, in fact, worked around a degraded system condition, such that samples were not collected in accordance with technical specifications.

In summary, PECO continued to make strides in improving performance in all programs in this functional area. Emergency preparedness and security program implementation were excellent. Radiological control program implementation by department workers was also assessed as excellent. Several incidents of radiation workers not adhering to management expectations indicated that implementation of radiological control practices by radiation workers had not reached the same level of excellence. The rating in this area reflects NRC concern over radiation worker adherence to procedures and to management expectations in the implementation of the radiological controls program.

The Plant Support area is rated as **Category 2**.