SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE
BEAVER VALLEY UNIT 1 AND UNIT 2

REPORT NO. 50-334/96-99 AND 50-412/96-99

I. BACKGROUND

The Systematic Assessment of Licensee Performance (SALP) Board convened on October 17, 1996, to assess the nuclear safety performance of Beaver Valley Unit 1 and Unit 2 for the period of June 4, 1995, through September 28, 1996. The board was convened pursuant to U.S. Nuclear Regulatory Commission (NRC) Management Directive (MD) 8.5, "Systematic Assessment of Licensee Performance (SALP)" (see NRC Administrative Letter 93-02). The board members included R. V. Crlenjak, (Board Chairman), Acting Deputy Director, Division of Reactor Projects, NRC Region I (RI); A. Randolph Blough, Deputy Director, Division of Reactor Safety, NRC RI; and John F. Stolz, Director, Project Directorate 1-2, NRC Office of Nuclear Reactor Regulation. The board developed this assessment for the approval by the Region I Administrator.

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

II. PERFORMANCE ANALYSIS - OPERATIONS

Plant Operations was rated Category 2 in the previous SALP period. A very good level of safety was demonstrated in both plant power operations and shutdown activities. Operator response to unanticipated transients was excellent. Outages were conducted in a superior manner. Management was ineffective in correcting recurring operator performance issues and ensuring that root cause analyses were performed for events involving personnel error. Operator training programs were generally effective, but some weaknesses were evident.

During this assessment period, overall operator performance has been good. The nuclear shift supervisors (NSSs) and assistant NSSs established close communications with field operators and maintained excellent control during refueling outage and unit startup evolutions. Unexpected conditions during fuel handling were appropriately evaluated and safely resolved. Poor self-checking practices, evident in the prior period, continued early in this assessment period. Examples included failure to perform certain surveillance tests when required (reactor coolant pump seal injection flow and source range nuclear instruments) and failure to properly maintain system configuration control (containment radiation monitors and exhaust dampers misaligned during control rod testing, improper manual containment isolation valve control during a reactor startup, and two mispositioned locked valves). However, performance improved later in the assessment period. In particular, operators responded very well to degraded plant conditions and prevented additional transients. Several safe and timely responses to transients were noteworthy; timely diagnosis and isolation of a ruptured Unit 1 river water expansion joint, prompt Unit 2 feedwater restoration following a transformer failure, safe response to two automatic reactor trips, and the conservative decision to manually trip the reactor in response to an unplanned cooldown during a Unit 2 shutdown.

Senior reactor operator (SRO) staffing levels were sufficient to meet the minimum technical specification requirements but did not provide sufficient additional personnel to address contingencies. This contributed to excessive work load for the control room SROs and shift technical advisors (STAs). The STA burden consequently limited the quality and depth of problem report (PR) root cause analyses early in the period. Changes to the PR system and reassignment of root cause analyses, to the line organization late in the period resulted in better quality assessments. Operator knowledge and skills were good based on performance in the control room and license requalification. Positive management actions were initiated to improve SRO staffing levels. A class of ten upgrade SROs is scheduled for licensing examination in early 1997 and a new class of seventeen SRO candidates and five reactor operator candidates began a certification program in October 1996.

Management response to issues has been conservative and focused on safety. On several occasions, management demonstrated the willingness to shut down the plant to perform equipment repairs to improve safety. Management specifically demonstrated a strong safety focus in response to a ruptured Unit 1 river water expansion joint, Ohio river flooding, a Unit 2 transformer isophase rubber boot replacement, and a recently discovered deficiency in diverse reactor trip protection circuitry.

Operators have generally displayed a questioning attitude in identifying several problems such as the defective Unit 2 transformer boot and early identification of Unit 1 pressure boundary leakage. However, on two occasions, operators inappropriately accepted substandard operating conditions. Inadequate priority was placed on repairing the Unit 2 air ejector radiation monitor which was unavailable for over three months and Unit 1 was operated the entire period with two pressurizer power operated relief valves (PORVs) inappropriately blocked.

Root cause evaluations and development of corrective actions have been successful in most cases. One notable exception was the post-trip review following the Unit 1 trip on May 31, 1996. Lack of a detailed post-trip review contributed to the failure to identify a significant protective system design deficiency prior to unit restart. Senior management's involvement in causal assessments such as the emergency diesel generator overspeed trips and establishment of the Nuclear Safety Review Board have had a positive effect on station operations.

In summary, operator performance has been good. Communications and supervisory oversight during unit startups and outage activities have been excellent. Self-checking practices and configuration control discrepancies which were observed to be poor early in the assessment period began to improve. Safe and timely operator response to degraded plant conditions and transients were noteworthy. Low SRO staffing levels contributed to excessive work loads in the control room. Establishment of new SRO license classes and revisions to the PR process were positive actions taken to address excessive work loads in the control room and improve root cause assessments. With the exception of operating with two pressurizer power operated relief valves (PORV) block valves shut for most of the SALP period, operators generally displayed a questioning attitude. Station management has provided effective oversight of activities with a strong focus on plant safety.

The plant operations area is rated Category 2.

III. PERFORMANCE ANALYSIS - MAINTENANCE

Maintenance was rated Category 1 in the previous SALP period. Improvement in maintenance performance had resulted in elimination of maintenance induced plant transients and equipment inoperabilities. Careful planning and excellent work controls had enhanced both switchyard and shutdown maintenance. Significant improvements had been noted in motor-operated valve maintenance. The backlog of maintenance requests was an area where additional effort was needed to ensure timely identification and disposition of safety-related deficiencies.

During this SALP period, the area of maintenance was effectively managed. The maintenance staff was well trained and knowledgeable, and competently performed maintenance and surveillance activities with few errors. Management demonstrated appropriate safety focus and made conservative decisions when warranted, initiating plant shutdowns and power reductions to repair degraded equipment and using risk assessment to ensure conservative system alignments for on-line maintenance. Examples included taking the Unit 2 main turbine generator off-line to replace a boot connecting the bus duct to the main transformer and shutting down Unit 1 to replace rubber expansion joints in the river water system.

During this assessment period, management made improvements in the work control process to reduce equipment outage times. The maintenance backlog was effectively controlled to ensure that outstanding work did not adversely affect plant operations. Although the maintenance non-outage backlog was generally reduced over the assessment period, an increase in the non-outage backlog trend did occur toward the end of the period. The increase was due to management decisions to temporarily shift resources to other priorities. During this assessment period non-outage backlog was reduced. Maintenance programs were effectively implemented to ensure that safety-related equipment was available to operate as designed. The maintenance history review program was effective in identifying repeat failures of equipment. The ISI program identified and properly evaluated an indication in a Unit 1 reactor coolant system cold leg. Further, changes to the heat exchanger test, monitoring, and maintenance program substantially improved service water system performance. The steam generator inspection and repair program was well implemented.

Root cause evaluations and development of corrective actions resulted in good equipment performance with few repetitive failures. Spurious actuations of the control room emergency habitability system were reduced, but were not completely eliminated. Root cause determinations, conducted by the maintenance and system engineering staffs, were productive in identifying a potential generic deficiency associated with the Unit 1 safety injection solid state protection system.

Corrective actions have addressed previous weaknesses in procurement support. Improvement was evident in the procurement support of outage maintenance. Procurement support for the replacement of the river water expansion joints was very good, as all necessary materials were available for the timely completion of the maintenance. Overall, the availability of parts to support emergent work and outages resulted in the timely completion of maintenance.

Although the maintenance staff performed maintenance and surveillance activities well, weaknesses were noted in the quality of some surveillance procedures, post-maintenance test procedures, and in the scheduling of certain tests. These weaknesses resulted in inadequate testing of some safety related circuits, an inadvertent start of the Unit 1 auxiliary feedwater pumps during testing of the main feedwater pumps, and some Unit 1 containment isolation valves not being stroke-time tested within the Technical Specifications required periodicity. Weaknesses were also apparent in vendor oversight. Examples included unintended emergency diesel generator overspeed trips during post-maintenance testing and a Unit 2 turbine runback which resulted when operators were attempting to isolate a leaking electro-hydraulic control valve. The leak was caused by an incorrect o-ring installed during control valve overhaul by the vendor.

In summary, maintenance programs were effectively implemented ensuring the reliable operation of safety related equipment. Maintenance non-outage backlog management ensured that outstanding work did not adversely affect plant operations. The maintenance staff was well trained and knowledgeable. Weaknesses were noted in the quality of certain surveillance tests, post-maintenance tests, in the scheduling of testing, and in vendor oversight. Management performed well in identifying problems in the maintenance area and developing appropriate corrective actions to address identified deficiencies. Examples of corrective action programs created to address problem areas included: an air operated valve maintenance program, a heat exchanger test and maintenance program, and a solid state protection system generic problem identification program.

The licensee's safety performance in the maintenance area is rated Category 1.

IV. PERFORMANCE ANALYSIS - ENGINEERING

In the last SALP period, engineering performance was rated as Category 2. A prior declining performance trend had been halted. Management involvement in engineering activities had improved, as had interdepartmental interfaces. The design change process had been generally working well. Areas for improvement included attention-to-detail, causal analyses of human performance issues, work prioritization and workload management.

In this SALP period, management attention to engineering functions and improvement efforts was very good. Resources were focused on reducing engineering work backlogs and improving timeliness. The Engineering Assurance Group was used effectively, particularly in the area of design change packages and processes, to review engineering products and programs to identify areas for improvement. A licensee safety system functional evaluation of the Unit 1 Safety Injection System was insightful and well-managed. Recent organizational changes, designed to more clearly define roles and to simplify the work environment, showed promise, but were too new to be fully assessed.

The quality of technical work and engineering products has typically been good. Engineering support to operational and maintenance issues was usually timely and effective. Response to emergent issues and identified problems was prompt and well-focused, and led to appropriate corrective actions. Examples included the response to the

reactor coolant pump (RCP) upper bearing oil level issue, correcting the ATWS Mitigation System Actuating Circuitry (AMSAC) design problem once it was understood, and the evaluation of problems with piping system susceptibility to thermally-induced over-pressurization. However, on some issues, such as water intrusion into the Auxiliary Feedwater System lubricating oil and failures of relief valves, corrective actions were slow and problems recurred. The quality of design change packages was consistently good. A good quality of technical work was reflected in submittals to NRC on licensing issues. Some problems with timeliness of submittals occurred early in the SALP period but were later remedied.

Although there were noteworthy examples of using an appropriate questioning approach to the plant design and configuration, there was also a need for continued or increased emphasis in this area. Technical support staff showed good engineering curiosity in pursuing design issues related to AMSAC, component cooling water piping overpressurization, and fire suppression system design. However, each of these issues had gone unidentified for an extended period of time, and a long-standing risk-significant issue involving the PORV block valve lineup was found by the NRC and not by the licensee.

The procedures and programs for conduct of engineering work were clearly defined. The operating experience feedback program was widely used and effective. The licensee provided good defense-in-depth and independence in the review and evaluation of steam generator tube inservice inspection results. A new computer-based system for tracking and scheduling engineering work showed some promise for improved programming of engineering resources. Knowledge level and day-to-day performance of engineering personnel were generally good.

In summary, engineering performance was good. Management attention to engineering activities and improvement initiatives was a strength. The quality of technical work and design changes was good; however, some corrective actions were slow and emphasis is needed on searching out old design problems and errors. Recent changes to the engineering organization and program were well-aimed but were too new to be assessed for their results and impact.

The licensee's safety performance in the engineering function is rated Category 2.

V. PERFORMANCE ANALYSIS - PLANT SUPPORT

In the previous SALP period, plant support functions achieved a generally excellent level of performance, and the area was rated as Category 1. In-plant radiological controls, ALARA, radioactive waste minimization efforts, effluent controls, and environmental monitoring were excellent, although there were some lapses in performance and worker support for some in-plant controls. The security and emergency preparedness programs demonstrated continuing strengths.

During this SALP period, overall effectiveness of radiological controls was a strength, but lapses in worker support persisted. Basic in-plant controls were well-maintained, and improvements such as electronic dosimetry and additional radioactive waste minimization measures were effectively implemented. Radioactive waste facilities and equipment received sufficient attention. Outage ALARA performance was good and benefitted from steam generator mock-ups and from aggressive controls on access and exposures. However, recurring problems occurred in worker adherence to established high radiation area controls, despite improved posting, barricading and access control points. Also, other examples of poor radworker practices occurred.

The licensee continued to implement excellent radioactive effluent controls and environmental monitoring programs. The calibration program for effluent and process radiation monitoring systems was a noteworthy strength. The cognizant personnel for air cleaning systems had excellent technical knowledge, and good practices were used to assure proper air flow balance.

Security program performance was characterized by appropriate security measures, as well as an effective corrective action process. A variety of hardware improvements were implemented effectively. Security force training was effective, and some additional training aids were procured. A focused effort was successful in reducing a backlog of security equipment work. Late in the SALP period, there were problems with the control of Safeguards Information that was in the custody of the Instrument and Controls staff.

Although the Emergency Preparedness (EP) program maintained some of its previously-noted strengths, a number of problems also became evident. Management support of EP was good. There were mechanisms in place for problem identification and resolution, including the self-assessment program. There was excellent rapport with offsite agencies, an excellent training program, and several improvements to the Emergency Response Organization staffing process. However, the EP program audits were limited in scope. More importantly, in the most recent EP exercise, although overall performance was acceptable and in-plant repair team efforts were effective, two significant weaknesses occurred: 1) the control room staff was overburdened and their efforts poorly coordinated, and 2) there was weak technical assessment of accident conditions by Technical Support Center staff.

The fire protection program and plant housekeeping were generally good. Although fire protection equipment was usually well-maintained, the licensee's audits found some areas of recurring problems.

In summary, the radiological controls program was generally aggressive and properly focused, but was not successful in obtaining consistent worker adherence to controls. Effluent controls and environmental monitoring maintained superior performance. The security program continued to be effective. The EP program maintained excellent rapport with offsite agencies and an excellent training program, but exercises revealed some weaknesses in response and technical assessment.

Overall, the licensee's safety performance in the plant support functional area is rated Category 2.

Enclosure 2

12 MONTH INSPECTION PLAN FOR BEAVER VALLEY POWER STATION, UNITS 1 AND 2

IP - Inspection Procedure
TI - Temporary Instruction
CO - Core Inspection (Minimum NRC Inspection Program (mandatory all plants))
SI - Safety Issue Inspection
RI - Regional Initiative Inspection

INSPECTION	TITLE/PROGRAM AREA	INSPEC-TION START DATES	TYPE OF INSPECTION COMMENTS
IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems	TBD Early '97	RI, Review recent changes to licensee oversight committees.
IP 71001	Licensed Operator Requal Program	TBD	CO
2515/127	Access Authorization	12/2/96	SI
IP 93801	Design Basis Review	TBD Early '97	SI
IP 84750	Environmental Monitoring	2/24/97	CO
IP 81700	Physical Security, Visit 1	3/3/97	CO
IP 37550	Engineering, Visit 1	3/31/97	CO, Focus on system engineering, work management and prioritization, and engineering efforts to validate the current licensing basis.
IP 83750	Radiological Controls (Radcon)	5/12/97	CO, Focus on high rad area access control and rad worker practices.
IP 82301	Emergency Preparedness (EP) Exercise	8/6/97	CO, Focus on technical assessment capabilities.

IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems	8/11/97	CO
IP 86750	Solid Radwaste	8/25/97	CO
IP 83750	Unit 1 Outage Radcon	9/1/97	CO
IP 62706	Maintenance Rule Program	TBD Mid '97	CO
IP 82701	Operational Status of EP Program	9/8/97	CO
IP 37550	Engineering, Visit 2	9/8/97	CO
IP 73753	Inservice Inspection Program	9/22/97	CO
IP 84750	Effluents Program	10/6/97	CO
IP 93808	Integrated Performance Assessment Process (IPAP)	10/27/97	CO
IP 81700	Physical Security, Visit 2	11/3/97	CO
IP 37550	Engineering, Visit 3	1/12/98	CO