U. S. NUCLEAR REGULATORY COMMISSION

REGION I

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Licensee:	Duquesne Light Company (DLC) Post Office Box 4 Shippingport, PA 15077
Facility:	Beaver Valley Power Station, Units 1 and 2
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EXECUTIVE SUMMARY

Beaver Valley Power Station, Units 1 & 2
NRC Inspection Report 50-334/98-05 & 50-412/98-05

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a 7-week period of resident inspection; in addition, it includes the results of announced inspection by a regional radiological protection specialist inspector.

Operations

- The Unit 2 reactor startup was safely performed. Emergent problems were addressed safely and comprehensively. Operator performance was generally good and employed the stop, think, act, and review (STAR) principle. An exception to the good human performance contributed to a turbine/generator trip while bringing the unit on line. (Section O1.2)

- Lessons learned from the Unit 1 startup were appropriately developed and implemented prior to the Unit 2 restart. The successful transfer from the bypass to the main feedwater regulating valves was a notable example of an implemented improvement. (Section O1.3)

- On September 2, Unit 2 experienced a loss of charging flow for 3 minutes. Control room operators responded promptly and identified a probable cause. (Section O1.4)

- The licensee developed and implemented a Unit 2 Restart Action Plan to provide assurance that known conditions adverse to quality were corrected and that personnel, processes, and equipment were ready for unit restart. The corrective actions were comprehensive to address the root causes for the extended forced unit outage. (Section O7.1)

- Quality Services Unit personnel identified a long-standing plant design discrepancy. While addressing this issue, engineers identified an unreviewed safety question affecting the Unit 1 River Water and Unit 2 Service Water systems. Interim compensatory actions were implemented and determined to be appropriate. Long-term corrective actions included processing an UFSAR change to correct the existing UFSAR description discrepancies. Enforcement discretion was exercised. (Section O8.2)

Maintenance

- On September 2, Unit 2 experienced a loss of charging flow for 3 minutes. Maintenance supervision did not aggressively pursue operator concerns and the loss of flow reoccurred 3 hours after the initial event. It was determined that maintenance technicians had stood on a swing arm check valve in the flow path causing the loss of flow. (Section O1.4)

- Maintenance work observed (including emergency diesel generator circuit breaker repair) was professional and thorough. Troubleshooting was accurate and complete. Command and control and necessary precautions were implemented well. Good self-checking by a maintenance technician prevented a potential oil spill in the emergency diesel generator cubicle. Good contingency planning on the direct current circuit breaker repair resulted in a well executed work activity. (Section M1.1)

- Operating personnel generally demonstrated good command and control of surveillance testing. The preevolution briefings for the high head safety injection and auxiliary feedwater full flow tests were comprehensive and discrete test abort criteria were established. (Section M1.2)

- Significant deficiencies in the technical specification (TS) surveillance testing program resulted in over 50 licensee event reports in the last 18 months. The long-standing problems resulted from broad knowledge deficiencies regarding TSs, a non-conservative philosophy regarding TS interpretation, and poor TS quality. Corrective actions and root cause assessments were comprehensive. The issues were discovered and appropriately resolved in response to a July 1997 escalated enforcement action. Enforcement discretion was exercised. (Section M1.3)

- The out-of-service times for two components (quench spray pump and system station service transformer) were prolonged due to maintenance activities which were not properly planned or coordinated. The safety related equipment was unavailable for a longer time period beyond that necessary to complete the work. (Section M1.4)

Engineering

- System engineers demonstrated comprehensive system knowledge and performance monitoring techniques regarding 480 volt breakers and station flood seals. Recommendations to preclude additional functional failures and work with industry experts to develop improved maintenance and monitoring practices were excellent. The Maintenance Rule Steering Committee properly evaluated performance for these systems and established appropriate performance goals. (Section E1.1)

- The descriptions of changes, tests, and experiments performed under the provisions of 10 CFR 50.59 described in the annual report, were sufficiently detailed to determine that the conclusions regarding these changes were reasonable. The changes have been properly incorporated in the Unit 1 and Unit 2 UFSARs. (Section E3.1)

- Nonconservatisms identified in the Unit 2 technical specifications (TSs) were properly addressed. Corrective actions included interim administrative controls, development of TS amendment requests, and process revisions that ensured the unit operates within its design basis. The safety significance of the design issues was low, and the licensee correctly determined that Unit 2 could restart prior to receiving TS amendment approval from the NRC. (Section E8.1)

- Corrective actions for eight violations from previous inspections were completed and addressed the concerns. In particular, comprehensive corrective actions were taken to ensure that leak seal repair activities are properly reviewed, planned, conducted and controlled. The overall controlling procedures and training were revised to ensure that the program is maintained at a high level. (Sections E8.2, E8.3, E8.4, E8.5, and E8.6)

Plant Support

- Effective radiological controls were established and implemented for the Unit 2 steam generator inspections, including very good oversight of radiological work activities and implementation of appropriate occupational radiation exposure minimization techniques. (Section R1)

- Effective radioactive contamination controls were implemented for steam generator inspections, but isolated instances of workers waiting in a supine position, in posted contaminated areas, were observed. This reflected lack of worker sensitivity to the potential for personnel contamination and attention to ongoing activities. (Section R1)

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Report Details

Summary of Plant Status

Unit 1 began this inspection period escalating in power after recovery from a reactor trip on August 11. The unit achieved 100% power on August 18 and operated at full power for the remainder of the period.

Unit 2 began this inspection period in cold shutdown (Mode 5). The plant entered hot shutdown (Mode 4) on September 23 and synchronized to the grid on September 29. This completed a 286 day forced outage during which numerous technical specification surveillance testing and design issues were corrected. The unit achieved 100% power on October 1.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

The inspectors conducted frequent reviews of ongoing plant operations. The conduct of operations was professional and safety-conscious; specific events and noteworthy observations are detailed in the sections below.

O1.2 Unit 2 Startup

a. Inspection Scope (71707, 92901)

The inspectors observed various startup activities from entry into Mode 4 on September 23 to power escalation on October 1. The inspectors examined adherence to procedures, effectiveness of briefings, communication between operators, engineers and maintenance technicians, human performance improvements, and resolution of emergent issues. The inspectors observed all or portions of the following procedures:

- 2OM-50.4.A "Plant Heatup from Mode 5 to Mode 4," Rev. 34
- 2OM-50.4.D "Reactor Startup from Mode 3 to Mode 2," Rev. 30
- 2OM-50.4.F "Performing an Estimated Critical Position Calculation," Rev. 5
- 2OM-52.4.A "Increasing Power from 5% Reactor Power and Turbine on Turning Gear to Full Load Operation" Rev. 34

b. Observations and Findings

Prior to entry into Mode 4, appropriate signoffs and reviews were completed. The inspectors noted good housekeeping in containment as determined by a final walkdown. Minor discrepancies were identified and properly addressed. Throughout the startup, various problems arose, including challenges to performing testing on check valves in the reactor coolant system and separately in the residual heat release system. Multiple discipline reviews (system engineering, design engineering, maintenance, and operations) were successful in addressing the issues

in a safe, comprehensive manner. The inspectors reviewed the corrective actions which included inservice testing requirement revisions. The revisions examined were in accordance with testing requirements. The inspectors noted that station management attention was instrumental in addressing the issues in a systematic method.

The inspectors observed particular evolutions including approach to criticality, preparations for turbine testing, and synchronization to the grid. The operating crews conducted the startup activities safely at a controlled pace. Corrective actions to previous human performance problems were implemented, including the use of the stop, think, act, and review (STAR) principle. A work standdown was also conducted to focus the site on the human performance issue. Preevolution briefings were detailed and highlighted the expected response and contingency actions to be taken. Lessons learned from the Unit 1 startup were effectively implemented (See Section O1.3). The transfer from the bypass feedwater regulating valves (FRVs) to the main FRVs was safely performed.

In one instance, operators did not demonstrate good self-checking principles, which contributed to a turbine/generator trip. While the operators made adjustments to the main generator exciter voltage, the voltage indicator monitored by the operators to prevent overexcitation was in the off position. Despite no change in voltage indication, operators made several exciter adjustments without stopping to evaluate the unexpected instrument response. After several adjustments to the exciter, the generator trip occurred. The reactor was unaffected as steam dump valves opened to maintain a constant secondary load. The turbine/generator trip and associated problems were captured under Condition Report 981800.

c. Conclusions

The Unit 2 reactor startup was safely performed. Emergent problems were addressed safely and comprehensively. Operator performance was generally good and employed the STAR principle. An exception to the good human performance contributed to a turbine/generator trip while bringing the unit on line.

O1.3 Unit 1 Restart Lessons Learned Application to Unit 2 Restart

a. Inspection Scope (71707)

The inspectors reviewed the identification of lessons learned from the Unit 1 restart and implementation prior to the Unit 2 restart.

b. Observations and Findings

Station management conducted a lessons learned meeting to identify good practices and issues from the Unit 1 restart that could be applied to the Unit 2 restart. Condition reports associated with the Unit 1 startup were also reviewed.

Significant lessons learned included inadequate communication of the gain change to the FRV actuators, and the necessity for procedure enhancement and training for the transition from the bypass FRVs to the main FRVs. Station management ensured that the Unit 1 feedwater procedure enhancements were implemented on Unit 2. All operating crews practiced the bypass to main FRV transfer on the simulator with the revised procedure. An extensive review of operating issues associated with the feedwater and auxiliary feedwater systems was performed by the system engineer and communicated to the operating crews.

The inspectors determined that the licensee identified and implemented appropriate Unit 1 lessons learned prior to the Unit 2 restart. An example was the successful implementation of the Unit 1 procedure changes for transfer of feedwater control from the bypass to the main FRVs.

c. Conclusions

Lessons learned from the Unit 1 startup were appropriately developed and implemented prior to the Unit 2 restart. The successful transfer from the bypass to the main FRVs was a notable example of an implemented improvement.

O1.4 Response to Inadvertent Closure of CHS-31

a. Inspection Scope (71707)

On Sept. 2, with the unit in Mode 5 (Cold Shutdown), control room operators received annunciator A2-3E, "Charging Line Flow Low," and noticed the charging line flow meter indicated no flow for approximately 3 minutes before returning to normal. The charging flow low annunciator then cleared. The inspectors evaluated operation and maintenance personnel's responses to this event.

b. Observations and Findings

The Reactor Coolant System (RCS) was at atmospheric pressure and with pressure maintained using a Volume Control Tank (VCT) float (e.g. VCT pressurized with nitrogen and providing 30 - 40 gallons per minute makeup to the RCS at low pressure). At 11:14 a.m., the control room operators received annunciator A2-3E, "Charging Line Flow Low," and noticed the charging line flow meter indicate no flow. Operations personnel responded promptly and appropriately to the annunciation by verifying that the charging isolation valves were open and that the flow control valve was in manual and fully open. Operators observed that pressurizer level was decreasing and manually isolated letdown. After approximately 3 minutes, charging flow returned to normal and the annunciator cleared. Operators restored normal letdown.

Operators surmised that the unexpected alarm had most likely resulted from maintenance work activities in the vicinity of 2CHS-31 (normal charging header weighted check valve). The nuclear shift supervisor (NSS) pursued resolution by contacting mechanical maintenance supervision concerning the possibility of

inadvertently closing 2CHS-31 while performing unrelated maintenance activities in the same vicinity. The mechanical maintenance supervisor attempted to contact the workers (inside containment) using the public address system but the workers did not respond. The supervisor resumed work on other issues and did not contact the workers during their lunch break. The maintenance workers returned to the field after lunch without any knowledge of the event. Operations personnel continued their investigation and sent a nuclear operator (NO) into containment. At 2:05 p.m., the NO observed a maintenance technician standing on the weighted arm of 2CHS-31. At the same time, the control room observed the identical indications as the 11:14 a.m. event. Although the safety significance of this event was low with the RCS at atmospheric pressure and in VCT float, the inspectors noted that ineffective action by maintenance supervision resulted in a repeat occurrence 3 hours later which further disrupted control room activities.

Operations stopped the work until appropriate measures could be implemented to prevent inadvertent closure of 2CHS-31. The event was communicated to Maintenance management which performed a thorough and detailed critique. The inspectors discussed the event with maintenance personnel, observed the critique, and determined the corrective actions from the critique were appropriate. All workers in the vicinity of the 2CHS-31 were briefed before work was resumed. A barrier was placed around the valve to prevent inadvertent closure. Mechanical maintenance management conducted a meeting of all Unit 2 mechanical craft to review the event.

c. Conclusions

On September 2, Unit 2 experienced a loss of charging flow for 3 minutes. Control room operators responded promptly and identified a probable cause. Maintenance supervision did not aggressively pursue operator concerns and the loss of flow reoccurred 3 hours after the initial event. It was determined that maintenance technicians had stood on a swing arm check valve in the flow path causing the loss of flow.

O7 Quality Assurance in Operations

O7.1 Assessment of Unit 2 Restart Action Plan Implementation

a. Inspection Scope (71707, 37551)

The licensee developed and implemented a Unit 2 Restart Action Plan (RAP) to provide assurance that known conditions adverse to quality were corrected and that personnel, processes, and equipment were ready for unit restart. The NRC had formed a Beaver Valley Oversight Panel (BVOP) to provide inspection oversight regarding licensee readiness for unit restart. The inspectors reviewed the RAP, observed licensee actions, interviewed personnel, and reported to the BVOP providing assessment of licensee readiness to restart Unit 2.

b. Observations and Findings

Based on reviewing the RAP and previous reviews prior to the Unit 1 restart, the inspectors determined that the RAP and its implementation were appropriate to address the root causes of the Unit 2 shutdown. The inspectors independently evaluated licensee implementation, validation, and oversight for the various RAP action items. Several of the programmatic items that applied to both units were previously reviewed prior to the Unit 1 startup and were not inspected during this period (e.g., TS compliance issues, timeliness of operability determinations, troubleshooting process, etc.). These items were discussed in NRC Inspection Report 50-334(412)/98-04. Additional selected inspectors' observations are listed below.

RAP Action Item P-2: Intent-Change TS Surveillance Procedure Changes
This issue related to Technical Specifications (TS) surveillance procedures being revised and classified as "non-intent changes" when the changes actually changed procedure intent. In some cases, these procedure changes had adversely impacted the station's interpretation of TSs without receiving an appropriate level of review and approval. The inspectors determined that the licensee review of the procedure change request backlog prior to entering Mode 4 was extensive and comprehensive.

RAP Action Item P-4: Backlog of High Priority Procedure Changes
This issue related to the review to ensure that all approved procedures can support plant operations above Mode 5. The inspectors reviewed the licensee review of all operations, maintenance, and engineering procedures to ensure TS were properly implemented. Maintenance procedures needed for plant operation and for activities scheduled within the next 3 months were reviewed. The licensee intends to review the remaining maintenance procedures prior to use. A unique TS reviewed stamp is placed on all procedures reviewed and non-reviewed procedures are not allowed to be used. The inspectors noted no discrepancies.

RAP Action Item C-4: Just-in-time Training
The inspectors reviewed the lesson plans for classroom and simulator training, for operators, which was completed prior to Unit 2 startup. Additionally, discussions were held with the appropriate training instructors concerning the lesson plans and training sessions. The classroom training concentrated on changes to TSs and procedures, and management expectations for complying with TSs and procedures. The simulator training stressed startup activities, and included lessons learned from the recent Unit 1 startup and plant trip. All operators were required to complete the training satisfactorily prior to assuming the watch for unit startup. The instructors were very knowledgeable concerning the subject matters, and the lesson plans were complete, with good examples used. Operator required training prior to Unit 2 startup adequately addressed changes made during the extended shutdown and lessons learned from the Unit 1 startup.

RAP Action Item S-8: Condition Report Backlog
The inspectors reviewed the condition report open status (effective 9/9/98) to verify that no items were open which would be a potential startup constraint. A number

of items were open, which indicated that closure was required prior to unit startup, and were being tracked with a due date prior to the Unit 2 startup date. Two items requiring closure prior to unit startup were identified with due dates later than the projected startup date. The inspectors were informed that one of the items was completed, and the other item was on the mode hold list, thus ensuring closeout prior to unit startup. The inspectors, however, identified a large number of open items several months past the established due dates, and one item still open for Unit 1, which was required to be closed prior to the Unit 1 startup (Unit 1 started up in early August). Management informed the inspectors that the Unit 1 overdue item had been completed prior to the startup, and remained open due to missing initials on the paperwork. The inspectors concluded that a weakness exists in that plant personnel are not properly requesting extensions to due dates and closing out corrective actions in a timely manner. The licensee acknowledged the deficiency and had previously initiated a condition report to resolve this weakness.

RAP Action Items P-18, M-1, M-9: Maintenance Work Request Backlog and Post Maintenance Testing Tracking

The inspectors reviewed the process used to ensure that the Unit 2 maintenance work request (MWR) backlog was properly reviewed to identify any open MWR that may represent an operability challenge during subsequent plant operation. The inspectors also reviewed the process to ensure that post maintenance testing was completed within the required mode restraints. Two senior reactor operators reviewed the MWR backlog and status of the MWRs on a daily basis to ensure that open issues were properly addressed. The reviews concentrated on the operational impacts of the MWRs. The inspectors concluded that the MWR backlog and post maintenance testing tracking was appropriately conducted and evaluated.

RAP Action Items M-2, M-3, M-8, M-10: System Health Review including Design Change Package, Engineering Memorandum, and Temporary Modification Review

The inspectors reviewed the system health evaluations performed by system engineers. The inspectors also examined the design change package (DCP), engineering memorandum (EM), and temporary modification (TM) backlogs. The system health reviews were a comprehensive evaluation of the system readiness for unit restart. The inspectors reviewed a sample of systems and did not identify any outstanding issues that would have prevented restart. The system engineers interviewed were knowledgeable on their systems and future scheduled work activities.

The inspectors reviewed the open EMs, TMs, and DCPs for Unit 2 and discussed the overall status and process with engineering management. As of September 11, 19 DCPs had been completed on Unit 2 during the forced outage, and there were no open class 1 (those requiring immediate attention) DCPs. As of October 2, 13 TMs were open. The inspectors reviewed selected EMs and confirmed that appropriate prioritization was assigned. No open Unit 2 TMs or DCPs were identified which required attention prior to Unit 2 startup. Tracking of open EMs, TMs, and DCPs was adequate, and management attention was appropriate.

RAP Action Item M-5, M-6: Operator Workarounds and Control Room Deficiency Review

The inspectors reviewed the operator workaround and control room deficiencies. The review did not identify any workarounds or control room deficiencies that would individually or collectively overburden or challenge the operators. However, some control room deficiencies were not listed. Also, resolution of the startup rate meter sticking problem was not being pursued prior to the inspectors questioning the Unit 2 Technical Assistant to the General Manager of Nuclear Operations (TAGMNO) and the Director of the Fix-it-Now group. The meters were successfully replaced prior to startup. In addition, operator knowledge of some of the workarounds was limited as demonstrated by their response to inspectors' questions. The Unit 2 TAGMNO briefed the crews on the operator workarounds.

c. Conclusions

The licensee developed and implemented a Unit 2 RAP to provide assurance that known conditions adverse to quality were corrected and that personnel, processes, and equipment were ready for unit restart. The corrective actions were comprehensive to address the root causes for the extended forced unit outage.

O8 Miscellaneous Operations Issues

O8.1 (Closed) LER 50-334/98-021: Gas Voids Discovered in the Low Head Safety Injection Discharge Piping to Suction Piping of the Charging/High Head Safety Injection System

a. Inspection Scope (92700)

The inspectors conducted an on-site review of the Licensee Event Report (LER) concentrating on the root causes and corrective actions. The inspectors interviewed the system engineer, maintenance and operations procedure writers and performed a system walkdown with the system engineer.

b. Observations and Findings

On March 24, 1998, while in Mode 5 (Cold Shutdown), performance testing following maintenance of the low head safety injection (SI) pump SI-P-1A in recirculation flow mode resulted in an unexpected indication of flow when there should have been none. Investigation of the flow anomaly identified voids in the low head SI discharge crossover piping to high head SI system. Subsequent engineering evaluation concluded that the size of the void in the "A" low head SI pump discharge line would have challenged the operability of both high head SI pumps. While not required in the current mode, one train of high head SI is required for Mode 4 (Hot Shutdown) and both trains are required in Modes 1-3.

The exact nature of the gas void formation could not be precisely determined, but the most likely cause was boundary valve leakage. The cause of the boundary

valve leakage was determined to be from either surveillance testing on the recirculation spray (RS) system or back leakage from the RCS. Two surveillance tests of the RS system were identified as potential sources of the voids. One surveillance pressure tests the pump casings with air to 42 psig and the other operates the pumps in recirculation flow. The other scenario identified was RCS back leakage through the low head SI system to the refueling water storage tank (RWST) which would allow hydrogen gas to come out of solution. However, this scenario seems unlikely since a leakage flow path to the RWST must also be present. The inspectors observed the piping locations where the voids were identified and verified the void formation assessment was reasonable.

As a corrective action, system engineers developed procedure 3BVT 02.11.01, "Void Monitoring," Rev. 0, which, on a monthly frequency, monitors the low head and high head SI systems for gas void formation. This procedure was performed twice with no voids identified. The remaining corrective actions involve revisions to the two RS surveillance procedures listed above and performance of a detailed inspection to confirm RCS back leakage if voids are identified. The RS surveillance procedures are on administrative hold pending these revisions.

c. Conclusions

On March 24, 1998, while in cold shutdown, voids in the low head safety injection discharge piping were discovered. The licensee event report properly documented the event and causal assessment. Corrective actions were appropriate and, when completed, will adequately address the root causes of the event.

O8.2 (Closed) LER 50-334/98-024: Internal Flooding Discrepancy in the Intake Structure Pump Cubicles.

a. Inspections Scope (92700, 92901)

The inspectors conducted interviews with operations shift supervisors, reactor operators and licensing engineers, reviewed annunciator response and abnormal operating procedures, and inspected the intake structure to evaluate corrective actions performed.

b. Observations and Findings

A quality assurance audit identified a discrepancy between the Updated Final Safety Analysis Report (UFSAR) and the plant configuration. Further evaluation of this condition resulted in the discovery of a previously unidentified failure mode (unreviewed safety question) which could render both trains of safety related Unit 1 River Water (RW) or Unit 2 Service Water (SW) inoperable due to a single credible failure of the piping pressure boundary and resultant internal flooding of an adjoining pump cubicle. The intake structure pump cubicle arrangement consists of four separate cubicles with each cubicle having an access/fire/security door and flood doors for external flooding protection that are maintained open. Adjoining cubicles

A and B, and cubicles C and D have interconnecting fire doors (normally closed) and flood doors (normally open) in practice and per the UFSAR.

The Unit 1 UFSAR (Section 9.7) indicated that no precautions are necessary to prevent flooding in the event of a major pipe rupture (internal flooding) because the open cubicle access doors will permit excess water to flow out of the cubicles. However, these doors also provide fire and security protection and have been maintained closed to meet fire protection and security requirements since shortly after Unit 1 startup, contrary to the UFSAR. Analysis showed that, if a RW pump discharge expansion joint failed, the cubicle would flood to a height that would cause the interconnecting fire door to the other cubicle to fail. This would submerge the motor control centers in the adjoining cubicle and render the redundant safety related RW/SW train inoperable.

The conflicting requirements to maintain the cubicle access doors both open and shut was discovered by the Quality Services Unit during a review in preparation for an audit. Condition Report 98-472 was generated.

Bases for continued operation (BCO) 1-98-007 and 2-98-003 were written to address the internal flood concern. In response to this concern, the interconnecting flood doors between the cubicles were closed. Engineering analysis determined that, with the interconnecting flood doors closed, the maximum water height that will result from the postulated expansion joint leak in one cubicle will not render any safety related RW/SW equipment inoperable in the adjacent cubicle. The BCOs require that both Unit 1 and 2 Operations personnel be notified prior to opening the interconnecting flood doors and, when opened, the A and B RW/SW systems will be considered as a single train. The inspectors concluded that the BCOs and associated administrative controls were appropriate. The licensee submitted a proposed change to the UFSAR to the NRC, to address the unreviewed safety question.

The inspectors confirmed that station alarm response procedures and abnormal operating procedures provided the necessary guidance to identify and mitigate the postulated internal flooding event.

The inspectors found that the above licensee identified "old design issue" was appropriately dispositioned and that appropriate corrective actions were implemented. The internal flooding concern resulted from a long-standing non-conformance to original design. The NRC is exercising discretion in accordance with Section VII.B.3 of the Enforcement Policy and refraining from issuing a citation for this problem. Enforcement discretion is exercised because: (1) the violation was licensee identified as a result of a voluntary initiative; (2) the corrective actions were comprehensive; and, (3) the design deficiency was subtle and not likely to be disclosed through routine surveillance or quality assurance activities.

c. Conclusions

Quality Services Unit personnel identified a long-standing plant design discrepancy. While addressing this issue, engineers identified an unreviewed safety question affecting the Unit 1 River Water and Unit 2 Service Water systems. Interim compensatory actions were implemented and determined to be appropriate. Long-term corrective actions included processing an UFSAR change to correct the existing UFSAR description discrepancies. Enforcement discretion in accordance with Section VII.B.3 of the Enforcement Policy was exercised for this licensee identified issue.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Routine Maintenance Observations

a. Inspection Scope (62707)

The inspectors observed all or portions of the following work activities:

- MWR 073741: Replacement of "B" Steam Generator Narrow Range Control Signal Summator
- MWR 070715: Replacement of the Emergency Diesel Generator Low Lube Oil Temperature Switch
- MWR 073814: Reactor Coolant Flow loop "A" low Flow Transmitter Spiking Troubleshooting
- MWR 074198: Emergency Diesel Generator dc (Direct Current) Circuit Breaker Repair

b. Observations and Findings

The inspectors found the work performed under these activities to be professional and thorough. Troubleshooting performed on the steam generator (SG) level control system was accurate and complete.

With respect to the SG level control circuit component testing, maintenance technicians identified that the SG narrow range control signal summator output was erratic. The MWR contained the appropriate level of detail for the task including the establishment of constant communications with Operations, verification of stable plant conditions prior to and during the work, obtaining spare fuses, and bench calibration of the new summator module. The pre-job briefing was performed in accordance with station procedure Nuclear Power Division Administrative Procedure (NPDAP) 8.23, "Infrequently Performed Tests or Evolutions," Rev. 3. A questioning attitude by the operators during the briefing resulted in additional checks of potential annunciations and level control problems. Communications between Maintenance and Operations personnel were good throughout the work activity. Prior to returning the level control system to automatic, the stability of the

summator control module output was verified. The work was performed as planned with no problems encountered.

Good self-checking by a maintenance technician prevented the possible spill of approximately 50 to 70 gallons of oil in the diesel cubicle. The clearance in support of the work to replace the emergency diesel generator (EDG) lube oil low temperature switch did not drain the lube oil from the cooler as expected. Removal of the temperature switch without the cooler drained could have resulted in the spillage of lube oil. The technician stopped the work and notified his supervisor. A condition report was also initiated.

The repair of the EDG dc circuit breaker was well planned and executed. The activity constituted an infrequently performed test or evolution (IPTE) in accordance with site procedure NPDAP 8.23. The IPTE briefing was adequate and the lessons learned were appropriate and current for the work activity. However, the inspectors questioned the Operations manager on the absence of the maintenance organization at the briefing since relevant industry information was highlighted. The Operations manager concluded that maintenance personnel would benefit from the information and re-briefed the maintenance crew prior to the job start. The physical work involved swapping the load side leads from the faulty breaker to a spare breaker in the same switchgear cabinet and was performed without de-energizing the switchgear cabinet. All necessary safety precautions were invoked including the use of non-conducting tools, rubber pads, safety clothing and protective face shields.

c. Conclusions

Maintenance work observed (including EDG circuit breaker repair) was professional and thorough. Troubleshooting was accurate and complete. Command and control and necessary precautions were implemented well. Good self-checking by a maintenance technician prevented a potential oil spill in the EDG cubicle. Good contingency planning on the dc circuit breaker repair resulted in a well executed work activity.

M1.2 Routine Surveillance Observations

a. Inspection Scope (61726)

The inspectors observed selected surveillance tests. Operational surveillance tests (OSTs), reviewed and observed by the inspectors are listed below.

- 2OST-24.4 "Steam Turbine Auxiliary Feed Pump [2FWE*22]," Rev. 30
- 2OST-11.14B "HHSI Full Flow Test," Rev. 6
- 2BVT-1.21.2 "Trevitest Method for Main Steam Safety Valve Setpoint Check," Rev. 2

b. Observations and Findings

The senior reactor operators demonstrated good command and control during the high head safety injection (HHSI) full flow test. The inspectors observed excellent communication among the operating crew. The briefing prior to the test was in accordance with the IPTE procedure. The operators had a clear understanding of acceptance criteria and contingency actions. The test was well supported by system engineers and maintenance personnel.

Strengths during the auxiliary feedwater pump test included a comprehensive preevolution briefing, establishment of discrete test abort criteria, and good coordination between operators, system engineers, and maintenance personnel. Non-licensed operators demonstrated initiative by addressing concerns of overcrowding around the auxiliary feedwater pump, with the test coordinator prior to the test.

The main steam safety valve test was completed safely with good support by operators, maintenance technicians, and system engineers. Problems with the testing apparatus were resolved; however, the system engineering supervisor was slow to inform the NSS of the problem. This action did not lead to adverse safety consequences, but the NSS did not have important information on the status of safety related equipment.

c. Conclusions

Operating personnel generally demonstrated good command and control of surveillance testing. The preevolution briefings for the HHSI and auxiliary feedwater full flow tests were comprehensive and discrete test abort criteria were established.

M1.3 Technical Specification Surveillance Testing Program

a. Inspection Scope (92700, 92901, 92902, 92712)

Between February 1997 and August 1998, the licensee reported over 50 separate failures to perform TS required surveillance tests. The inspectors reviewed the individual LERs for accuracy, reportability, and a sample of corrective actions. The inspectors evaluated the causal factors and corrective actions to address the overall issue. The inspectors also reviewed the overall significance including whether the NRC escalated enforcement action taken in July 1997 encompassed the additional findings.

b. Observations and Findings

The licensee identified significant deficiencies with respect to their TS surveillance testing (TSST) program. The licensee originally identified several violations of TS surveillance testing requirements in early 1997. By letter dated July 3, 1997, the NRC issued violation EA 97-255 in response to six violations of TSST requirements. In the response to the violation, the licensee determined that inadequate

management oversight and control of the TSST program was the root cause of the violations, and that weaknesses in procedures, scheduling, coordination, and communications were contributing factors. Corrective actions included: 1) reviewing existing surveillance test procedures to assure they adequately implement TS and other requirements; 2) ensuring that all TS surveillance procedures and procedure revisions are reviewed by the system and performance engineering department; and 3) centralizing the coordination and scheduling process for TS surveillances.

In NRC Inspection Reports 50-334(412)/97-11 and 98-01, the inspectors noted that the licensee TSST review team conducted a thorough and detailed review of the TSST requirements and associated surveillance procedures. Through these reviews, the licensee identified numerous testing discrepancies. Unit 1 shut down on January 31 due to a missed TSST requirement.

Following the Unit 1 forced shutdown in January 1998, senior management acknowledged the broad scope and significance of TSST problems. Additional substantial corrective actions were planned and implemented including: 1) various self assessments; 2) TS compliance training; and 3) a station wide review of procedures to identify possible non-compliances with TSs. NRC inspectors and multi-faceted licensee self assessments determined that long-standing problems including broad knowledge deficiencies regarding TSs, a non-conservative philosophy regarding TS interpretation, and poor TS quality were the primary causal factors.

In NRC Inspection Report 50-334(412)/98-01, the inspectors determined, based on interviews and independent review of the self assessments, that the licensee assessment of the TS surveillance program deficiencies was detailed and causal assessment was adequate. The TS compliance training and the procedure reviews were noteworthy, and the broad scope of people trained and procedures reviewed strengthened the process. This determination was documented in NRC Inspection Reports 50-334(412)/98-02 and 98-03.

The escalated enforcement action was the result of six surveillance testing violations (requiring LERs). Eight additional LERs (violations of surveillance requirements) and associated supplements were closed in subsequent inspection reports. The licensee identified 40 additional TS surveillance violations, requiring LERs and their supplements. The violations were identified by the TSST reviews, during procedure reviews, and through an improved questioning attitude by site personnel. The inspectors reviewed selected individual corrective actions and noted that the individual items were corrected. Separately, the licensee identified surveillance testing discrepancies through their response to NRC Generic Letter (GL) 96-01, "Testing of Safety-Related Logic Circuits." The GL 96-01 issues were addressed separately from the general surveillance testing issue discussed in this section.

In addition to their corrective actions, the licensee submitted a special report on September 30, 1998 to the NRC. The report provided an overview of the TS

compliance issues and the corrective actions taken. In support of their submittal, the licensee performed an additional assessment of LERs and condition reports associated with TS compliance to determine if the corrective actions taken have addressed all causes for TS compliance challenges. The operations department also evaluated the effectiveness of the corrective actions through a self assessment. Both reviews concluded that the completed corrective actions successfully addressed the root causes. The self assessment identified additional enhancements to surveillance scheduling. The inspectors concluded that the additional measures strengthened the previous corrective actions.

The number of missed surveillances represented significant breakdowns in the TS surveillance program, TS compliance, and overall non-conservative application of TS requirements. Individually, the missed TSSTs had minimal safety consequences. The missed surveillances were successfully performed following discovery of the deficiency. The NRC is exercising discretion in accordance with Section VII.B.4 of the Enforcement Policy and refraining from issuing a citation for this problem. Enforcement discretion is exercised because: 1) the violations were licensee identified as part of the corrective actions for previous enforcement action (EA 97-255); 2) the violations had similar root causes to the original violation; 3) the violations do not substantially change the safety significance or the character of the regulatory concern arising out of the original violation; and 4) the corrective actions were comprehensive.

The 40 LERs and their supplements closed by the exercise of enforcement discretion are listed at the end of this inspection report under the title items opened, closed, and discussed. This review also closed the previous escalated enforcement items.

c. Conclusions

Significant deficiencies in the TS surveillance testing program resulted in over 50 LERs in the last 18 months. The long-standing problems resulted from broad knowledge deficiencies regarding TSs, a non-conservative philosophy regarding TS interpretation, and poor TS quality. Corrective actions and root cause assessments were comprehensive. The issues were discovered and appropriately resolved in response to a July 1997 escalated enforcement action. Enforcement discretion in accordance with Section VII.B.4 of the Enforcement Policy was exercised for these additional licensee identified issues.

M1.4 Unplanned Use Of Limiting Condition of Operation Time During Maintenance

a. Inspection Scope (62707)

The inspectors reviewed selected TS Limiting Condition of Operation (LCO) maintenance activities.

b. Observations and Findings

On September 3, 1998, at 5:29 a.m., de-energization of the Unit 1 A System Station Service Transformer, in order to support maintenance activities on the 3A transformer, required entering a 72 hour LCO in accordance with TS 3.8.1.1. A probablistic risk assessment (PRA) out of service time of 15 hours was established for this activity. Maintenance on the 3A transformer was delayed approximately 2 hours due to mis-communications between the control room staff and the transmission operator. The out of service time did not exceed either the LCO or PRA established durations.

On September 14, the Unit 1 "B" train of Quench Spray (QS) was removed from service for preventive maintenance. In accordance with TS 3.6.2.1, the unit entered a 72 hour LCO. Restoration of the system was scheduled for the end of dayshift but was delayed due to the suction valve motor operator run current exceeding 120% of it's nameplate value. The following morning, the performance engineer determined that the motor operator run current was acceptable in it's current "as found" condition. The run current for this test was consistent with previous test results and did not indicate degraded performance. The motor operated valve was declared operable, but approximately 16 to 24 hours of unnecessary LCO time was incurred while station personnel attempted to resolve the apparent test result discrepancy.

The inspectors discussed the test results with the performance engineer and determined that past performance data was available but was not included in the planning. The inspectors determined that the lack of consideration of past performance data prior to performing the testing resulted in the unnecessary use of 16 to 24 LCO hours. The inspectors discussed this issue with the system engineer who indicated that QS procedure changes would be forthcoming to preclude repetition.

c. Conclusions

The out-of-service times for two components (QS pump and system station service transformer) were prolonged due to maintenance activities which were not properly planned or coordinated. The safety related equipment was unavailable for a longer time period beyond that necessary to complete the work.

III. Engineering

E1 Conduct of Engineering

E1.1 Maintenance Rule Applications to System Performance Trending

a. Inspection Scope (37551, 62707, 92903)

The inspectors attended a Maintenance Rule Steering Committee (MRSC) meeting and performed independent reviews of the systems discussed to determine whether safety related systems, structures, and component (SSC) performance was being properly monitored and maintained.

b. Observations and Findings

On August 21, 1998, the MRSC met to discuss 480 volt breakers and various flood seal deficiencies identified over the past year. System engineers presented detailed material history reviews, analysis, and recommendations with regard to maintenance rule classifications.

Unit 2 480 Volt Breakers
System engineers identified a negative performance trend in that 480 volt breakers failed to trip open during periodic testing. Ninety-two model K-600S breakers were potentially effected, including 43 safety related breakers. By design, the shunt trip coil should cause the breaker to trip open upon sensing an undervoltage condition. Breaker failure to open as designed could damage safety related equipment or overload the EDGs under certain accident mitigation scenarios.

In 1996, five breakers had failed to trip during testing (at 100 volts dc control power), but remained operable. Engineers determined that the shunt trip coils had degraded due to aging and that grease within the breakers had hardened, increasing resistance to the trip mechanism. An appropriate breaker refurbishment and lubrication preventive maintenance (PM) program was then initiated, but would take several years to fully implement. An additional 480 volt breaker failed during testing in April 1998. In this case, engineers determined that the breaker degraded sufficiently to become inoperable. The inspectors confirmed that the resulting increased EDG loading remained within the station's accident analysis assumptions.

Engineers determined that the current test method, which applied 100 volts dc control power, may not identify performance degradation prior to a breaker becoming inoperable. Based on information discussed at industry working group meetings, engineers revised the breaker test procedures to test the shunt coil trip at reduced control voltage (85 volts vs. 100 volts dc used for previous tests). This revision made the test predictive in nature, in that degraded breaker performance would be revealed before the breaker actually became inoperable. The inspectors independently reviewed electrical design calculations and confirmed that the revised test method and subsequent 1998 test results identified breaker degradation prior to the breakers becoming inoperable.

Engineers recommended that 480 volt breakers be placed in maintenance rule category (a)(1), established appropriate monitoring goals, and implemented an accelerated test program during the plant outage. Based on their findings, all Unit 2 safety related K-600S breakers were tested and refurbished as recommended by the vendor maintenance manual prior to Unit 2 restart. An accelerated test and PM program was also established for the remaining non-safety related breakers. Beaver Valley engineers hosted an industry workshop on 480 volt breakers in September 1998 to discuss their findings and, with manufacturer concurrence, develop an improved industry guidance document. The inspectors observed portions of the workshop and noted that improved testing and PM techniques were discussed.

Deficient Flood Seals

The Unit 2 safeguards structure was placed in maintenance rule category (a)(1) following identification of missing flood protection seals for all four recirculation spray pumps in January 1997. No additional structural problems were identified in the Unit 2 safeguards building during the next 18 months. However, on five separate occasions between May 1997 and September 1998, the licensee identified additional missing flood seals at the station. One of the missing seals (described in LER 50-334/98-016-01) was properly classified as a maintenance preventable functional failure (MPFF) which affected the Unit 1 auxiliary feedwater system.

The MRSC determined that the missing flood seals represented a programmatic problem, whose performance would not be properly monitored by focusing on only the Unit 2 safeguards structure. A new station-wide flood seal inspection program was developed in mid 1998. The MRSC designated the station Flood Penetration Seal Program as a maintenance rule category (a)(1) system and established appropriate monitoring goals. The MRSC determined that the Unit 2 safeguards structure should be reclassified as a category (a)(2) SSC. New flood seal inspection procedures were developed for each unit and scheduled for completion by October 31, 1998. The inspectors reviewed the procedures and observed field performance of selected flood penetration seal inspections. Engineers were knowledgeable and performed detailed inspections which identified several missing flood penetration seals. The inspectors determined that designation of the Flood Penetration Seal Program as category (a)(1) and the Unit 2 safeguards structure as a category (a)(2) SSC was appropriate.

c. Conclusions

System engineers demonstrated comprehensive system knowledge and performance monitoring techniques regarding 480 volt breakers and station flood seals. Recommendations to preclude additional functional failures and work with industry experts to develop improved maintenance and monitoring practices were excellent. The Maintenance Rule Steering Committee properly evaluated performance for these systems and established appropriate performance goals.

E3 Engineering Procedures and Documentation

E3.1 Review of Unit 1 and Unit 2 10 CFR 50.59 Annual Reports

a. Inspection Scope (37001)

Licensees are required by 10 CFR 50.59(b)(2) to annually submit a report containing a brief description of the safety evaluations for changes, tests, and experiments performed under the provisions of 10 CFR 50.59. By letter dated June 5, 1998, the licensee submitted this report for Unit 1 for the period of January 23, 1996, through January 22, 1997. By letter dated June 18, 1998, the licensee submitted this report for Unit 2 for the period of November 1, 1996, through October 31, 1997. The reports were reviewed to determine if the changes were described in sufficient detail to determine if the conclusions, that the changes did not involve an unreviewed safety question, appeared reasonable.

b. Observations and Findings

The 10 CFR 50.59(b)(2) annual reports contained descriptions of design changes, technical evaluation reports, corrections and update of UFSAR information, changes to temporary operating procedures, and temporary modifications. The licensee concluded that the changes described in the annual reports did not involve unreviewed safety questions. The inspectors determined that the descriptions of changes described in this report were of sufficient detail to conclude that none of these changes involved an unreviewed safety question.

The inspectors also selected a sample of the changes described in this annual report and determined that these changes have been incorporated in the Unit 1 and Unit 2 UFSARs.

c. Conclusion

The descriptions of changes, tests, and experiments performed under the provisions of 10 CFR 50.59 described in the annual report, were sufficiently detailed to determine that the conclusions regarding these changes were reasonable. The changes have been properly incorporated in the Unit 1 and Unit 2 UFSARs.

E8 Miscellaneous Engineering Issues (92903, 92700)

E8.1 Operability Reviews for Unit 2 Restart

a. Inspection Scope (37550)

As documented in NRC Integrated Inspection Report 50-334(412)/98-04, the licensee identified 14 issues for which the current TSs were non-conservative with respect to the stations' design basis. In preparation for Unit 2 restart, the inspectors independently reviewed six issues and associated corrective actions that applied to Unit 2.

b. Observations and Findings

The inspectors reviewed each of the six issues in detail, including assessment of associated operability evaluations, position papers, and BCO documents. In each case, using NRC GL 91-18, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions," Rev. 1, the licensee determined that no TS amendment was needed prior to unit restart. A selected group of the issues are discussed below.

Overpressure Protection System

On January 15, 1996, Problem Report No. 2-96-92 noted that at some reactor coolant system temperatures (below 350°F) the overpressurization protection system setpoints in TS Figure 3.4-4 were non-conservative. The pressurizer power operated relief valves would not open at a low enough pressure to ensure that the pressure excursion (resulting from the analyzed transients) would not exceed the pressure/temperature limit curve of TS Figure 3.4-4.

In response to Problem Report No. 2-96-92, design engineers reviewed station operating history and concluded that analysis limits were not exceeded during previous operations. The licensee subsequently developed appropriate administrative controls, which included revisions to applicable station procedures and an administrative limit change to TS Figure 3.4-4, to ensure that the analysis limits will not be exceeded. The licensee also implemented BCO 2-98-006, which justified use of the administrative controls until a TS amendment is approved. The inspectors reviewed the Operating Manual (OM) changes and the administrative limit imposed by the revision to TS Figure 3.4-4 and concluded that these administrative controls were adequate for plant restart prior to receiving a TS amendment.

During this inspection period, the inspectors also reviewed and determined acceptable for plant restart, the administrative controls implemented at Unit 2 for the following issues.

- Continued reactor operation of reduced thermal power levels with inoperable Main Steam Safety Valves (BCO 2-98-007)
- EDG Largest Single Load Rejection Test (BCO 2-98-010)
- EDG Fuel Oil Storage Tank Level (BCO 2-98-009)
- EDG Operating Frequency (BCO 2-98-012)
- Refueling Water Storage Tank Level (BCO 2-98-008)

c. Conclusions

Nonconservatisms identified in the Unit 2 TSs were properly addressed. Corrective actions included interim administrative controls, development of TS amendment requests, and process revisions that ensured the unit operates within its design basis. The safety significance of the design issues was low, and the licensee correctly determined that Unit 2 could restart prior to receiving TS amendment approval from the NRC.

E8.2 (Closed) VIO 50-334/97-07-02: Improper Reduction of Commitments in the Quality Assurance Program Description

This violation concerned a change in the facility organization in which the Quality Control receipt inspectors were moved from Quality Services Unit to the Procurement Department. This organizational change to the quality assurance (QA) program was a reduction in commitment in the QA program description, which was implemented without prior NRC approval as required by 10 CFR 50.54(a)(3). The response to this violation was documented in a letter dated December 8, 1997. The inspectors determined that the response appropriately addressed the violation. Based on on-site interviews and document reviews, the inspectors concluded that the corrective actions were properly implemented to preclude recurrence of a similar event. The licensee conducted a review which determined that there had not been other organizational changes that could potentially result in other reductions in commitments in the QA program description. The inspectors also noted that by letter dated July 17, 1998, the licensee submitted a proposed change to the facility organization described in the Unit 2 UFSAR. The proposed change would allow warehouse quality control inspectors to report to the Manager, Nuclear Procurement, rather than the Manager, Quality Services. The proposed change is currently being reviewed by the NRC.

E8.3 (Closed) Violations (EA) 50-412/96-540(01013, 01023, 01033, 01043): Inadequate Oversight, Design Control, Procedures, and Review of Safety Related Leak Repair

a. Inspection Scope

The inspectors reviewed the response to the violations, concentrating on programmatic corrective actions. The inspectors verified corrective actions were complete by reviewing procedures, training records, and other management communications to plant personnel regarding leak repair activities.

b. Observations and Findings

In December 1996, an inadequately controlled leak seal repair activity resulted in the migration of leak sealant to unintended portions of the reactor head vent system. One valve subsequently became bound and failed to fully stroke. Several root causes were identified. The activity was not controlled in that the quantity and injection pressure of leak sealant material was not properly verified. Adequate measures were not provided to verify suitable leak sealant material; an incorrect system temperature was specified. The licensee did not ensure that the leak sealant quantity and pressure were adequately controlled by procedure. The licensee did not ensure that the vendor activity was properly conducted in that the injection gun loading, drill and tap location, injection pressure and the amount of sealant were not properly overseen. Finally, the vendor procedures were not properly reviewed and approved.

For the reactor head vent system, the affected piping and valves were replaced. Other leak repairs were evaluated, and an engineering evaluation of the leak repair program was completed.

On February 1, 1997, Engineering Standard (ES)-G-021, "On-Line Leak Repair," was issued. This standard established the methods necessary to perform an engineering review of all safety related and non-safety related on-line leak repairs. Common on-line leak repair methods, reviews of vendor void calculations and recommended injection pressures, review of proposed injection method, and review of proposed sealant compounds are discussed. The standard also describes the development of the temporary modification package for the repair.

Procedure 1/2CMP-75-Leak Repair-1M, "On Line Leak Repair Planning Procedure," was extensively revised on January 30, 1997, and April 3, 1997, to provide detailed instructions to perform pre-job evaluations and planning for on-line leak repair jobs. The procedure assigns specific responsibilities for engineering and maintenance personnel to evaluate and plan the activity. Overall ownership of the temporary leak repair process is the responsibility of the Nuclear Engineering Department. The procedure clearly determines the system parameters at the location of the leak. This information is used to determine the appropriate leak repair method, in consultation with the vendor. The procedure also requires that the job specific leak repair procedure be properly reviewed and approved. The attachments to the procedure specify system component parameters, the leak sealant material quantity, and injection pressure. The attachments also specify the minimum requirements for job specific leak repair procedures and procedural holdpoints for loading sealant into guns, drill and tap location, that maximum allowed sealant volume is not exceeded, and that maximum specified injection pressure is not exceeded.

c. Conclusions

The licensee took comprehensive actions to ensure that leak seal repair activities are properly reviewed, planned, conducted, and controlled. The overall controlling procedures and training were revised to ensure that the program is maintained at a high level. Additionally, appropriate actions were taken to ensure that vendor activities are properly conducted with licensee oversight, and that vendor procedures are properly reviewed and approved.

E8.4 (Closed) VIO 50-412/98-01-05: Design Control Measures for a Modification to the Unit 2 Emergency Diesel Generator Ground Overcurrent Trip Isolation Feature

During inspection of the EDG motor operated ground switch in NRC Inspection Report 50-334(412)/98-01,the design control measures for a modification to the Unit 2 EDG ground overcurrent trip isolation feature were found to be inadequate. Specifically, the failure mode analysis for this design change did not evaluate failures of the quality assurance Category 2 ground switch and resistor. The failure mode analysis also did not identify or evaluate an additional failure mode which had the potential to damage the EDG during surveillance testing if a fault occurred on

the 4 kV line. This was a violation of 10 CFR 50, Appendix B, Criterion III. The scope of this review was to evaluate the corrective actions for this violation.

The May 22, 1998, response to this violation documented four corrective actions taken and one corrective action to be taken to avoid further violations. The actions taken were: 1) the Technical Evaluation Report (TER) 11704 was revised and issued on March 7, 1998, to change the design back to its original configuration; 2) TER 11704, Rev. 1 was completed on EDGs 2-1 and 2-2 on March 8 and 9, 1998; 3) this issue was presented during Nuclear Engineering Department (NED) engineering support training to reinforce management expectations regarding the need to throughly understand the design and licensing bases requirements before making any modifications; and 4) the NED manager issued a letter on April 28, 1998, to all NED personnel to reinforce management expectations regarding the need to throughly understand the design and licensing bases requirements before making any modifications. In addition the licensee committed to revise NED Standard ES-E-003 by December 31, 1998, to document the design basis of the Unit 2 EDG motor operated ground switch.

The inspectors confirmed that corrective actions were completed to return the Unit 2 EDG ground overcurrent trip isolation feature back to its original design (Items 1 and 2, above). This event was the subject of special training to engineers in March 1998 (Item 3) and the NED manager letter was issued (Item 4). Although revision of NED Standard ES-E-003 has not been completed, the inspectors confirmed that such completion was entered into Corrective Action Tracking System (CATS) (No. A 980413A).

E8.5 (Closed) VIO 50-334(412)/98-80-03: Change to Allow Storage of Propane Next to the Auxiliary Intake Structure

In NRC Inspection Report 50-334(412)/98-80, inspectors identified that the safety evaluation for DCP 2133, Modification to Supply Propane Gas to an Existing Furnace in the Auxiliary Intake Structure Building and to Add a Concrete Pad to Support Three 1000-Gallon Propane Storage Tanks, failed to evaluate any potential hazards or impact on equipment important to safety associated with the storage of large quantities of liquid propane next to the auxiliary intake structure. This failure to perform an adequate safety evaluation was a violation of 10 CFR 50.59. The inspectors reviewed the corrective actions documented in the April 8, 1998, response to this violation and determined that the corrective actions adequately addressed the violation.

E8.6 (Closed) VIO 50-334/98-80-04: Implementation of Procedure Change Process

During review of a temporary operating procedure (TOP) and associated change related to the Unit 1 residual heat removal and component cooling, reactor (CCR) systems in NRC Inspection Report 50-334(412)/98-80, the inspectors found that 1TOP-97-28, "Determining the Final Throttled Positions of 1CCR-249 and 250," was implemented incorrectly as a non-intent change and without the necessary 10 CFR 50.59 safety evaluation. This failure to perform a safety evaluation was a

violation of 10 CFR 50.59. The inspectors reviewed the corrective actions documented in the April 8, 1998, response to this violation and determined that the corrective actions adequately addressed the violation.

E8.7 (Closed) LER 50-412/96-06: Potential Control And Protection System Interaction in Steam Generator Water Level Control.

The inspectors conducted an onsite review of the LER. The issue was documented in NRC Inspection Report 50-334(412)/96-08and 96-10 and resulted in an NCV. Through interviews and review of records, the inspectors determined that the corrective actions were appropriate. The long term corrective actions were still being developed and planned.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

a. Inspection Scope (83750)

The inspectors reviewed the programs for the control of radiological work performed in support of SG inspections at Unit 2. Areas examined included: (1) radiation work permits (RWPs) and reviews to ensure that radiation exposures are maintained as low as is reasonably achievable (ALARA); (2) hot particle controls; (3) posting and control of high radiation areas; and, (4) management oversight.

This inspection was performed by touring and observing work being performed in the Unit 2 containment, specifically in and around the three steam generators; review of RWPs, ALARA reviews and jump tickets; and through interviews with licensee personnel.

b. Observations and Findings

The licensee provided effective radiological controls oversight of SG radiological work activities. The licensee obtained approximately thirty contractor radiological protection (RP) technicians to aid in controlling this radiological work. RP technicians were assigned to control access and provide job coverage at each of the three SG/reactor coolant pump cubical entrances, as well as at the work control center established outside the radiation controlled area. Multiple radiation work permits were established to control the work and the dedicated radiation protection coverage in these areas included regular periodic surveillances of the work area for changing radiological conditions and the detection of hot particles. Workers entering the SGs were provided constant visual coverage using the closed-circuit cameras and direct communications and teledosimetric links to dedicated radiation protection technicians located in the work control area.

The licensee also provided overall effective occupational exposure reduction efforts for the inspection activities. Specific initiatives taken to control this work and maintain exposures ALARA included the use of remote teledosimetry and closed-

circuit cameras to minimize the number of workers needed on the work platforms near the generators and better position workers on the platforms to minimize their exposures. Occupational exposures for the SG inspection tracked well with established goals through the first week of work.

The licensee implemented effective contamination controls for the SG work activity. Specifically, each SG area was modified to establish a hot particle/high contamination control zone which included a work platform adjacent to the hot and cold-leg manways.

Although overall contamination controls were effective, two examples of workers (vendor inspection personnel) on the SG work platforms lying in a supine position, in a posted contaminated area were identified, which reflected lack of worker sensitivity to the potential for personnel contamination and attention to ongoing activities. The workers were in a posted hot-particle zone.

This latter item was noted to be similar to that identified by the NRC in October 1997 during the Unit 1 refueling outage (Reference NRC Inspection Report 50-334/97-08). Radiation protection and station management took prompt corrective actions upon being notified of this matter, including enhanced monitoring of ongoing work.

c. Conclusions

Effective radiological controls were established and implemented for the Unit 2 steam generator inspections including very good oversight of radiological work activities and implementation of appropriate occupational radiation exposure minimization techniques. Also, effective radioactive contamination controls were implemented for steam generator inspections. However, isolated instances of workers waiting, in a supine position, in posted contaminated areas were observed, which reflected lack of sensitivity to the potential for personnel contamination and attention to ongoing activities.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on October 8, 1998. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

X2 Management Meeting Summary

On September 2, 1998, a Unit 2 Plant Status call was conducted between S. Jain and members of the DLC staff and the NRC Beaver Valley Oversight Panel. The licensee discussed the status of completing their Unit 2 Restart Action Plan, management oversight activities, and pending licensing actions.

INSPECTION PROCEDURES USED

IP 37001:	10 CFR 50.59 Safety Evaluation
IP 37550:	Engineering
IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observation
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 83750:	Occupational Radiation Exposure
IP 92700:	Onsite Follow-up of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92712:	In-Office Review of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92901:	Follow-up - Operations
IP 92902:	Follow-up - Maintenance
IP 92903:	Follow-up - Engineering

ITEMS OPENED, CLOSED AND DISCUSSED

Opened/Closed		
50-334(412)/98-05-01	NCV	Failure to Maintain Intake Structure Design in Accordance with the Design Basis, Enforcement Discretion Granted for this SL3 Problem under VII.B.3 of the NRC Enforcement Policy. (Section O8.2) [Reference LER 50-334/98-24]
50-334(412)/98-05-02	NCV	Missed Technical Specification Requirements, Enforcement Discretion Granted for this SL3 Problem under VII.B.4 of the NRC Enforcement Policy (Section M1.3) [Reference 40 LERs and Supplements Listed Below under Technical Specification Surveillance Testing Issues]
Closed		
50-334/98-21	LER	Gas Voids discovered in the Low Head Safety Injection Discharge Piping to Suction Piping of the Charging/High Head Safety Injection System (Section O8.1)
50-334/98-24	LER	Internal Flooding Discrepancy in the Intake Structure Pump Cubicles (Section O8.2)
50-334/97-07-02	VIO	Improper Reduction of Commitments in the Quality Assurance Program Description (Section E8.2)
50-412/96-540	EA	Inadequate Oversight, Design Control, Procedures, and (01013, 01023, 01033, 01043) Review of Safety Related Leak Repair (Section E8.3)
50-412/98-01-05	VIO	Design Control Measures for a Modification to the Unit 2 EDG Ground Overcurrent Trip Isolation Feature (Section E8.4)
50-334(412)/98-80-03	VIO	Change to Allow Storage of Propane Next to the Auxiliary Intake Structure (Section E8.5)
50-334/98-80-04	VIO	Implementation of Procedure Change Process (Section E8.6)
50-412/96-06	LER	Potential Control and Protection System Interaction in Steam Generator Water Level Control (Section E8.7)

Closed - Technical Specification Surveillance Testing Issues

50-334(412)/97-255	EA	Missed Surveillance Tests (Section M1.3)(01023, 01033, 01043, 01053, 01063, and 01013 for Docket 50-334 only)
50-334/97-26	LER	Control Room Ventilation Isolation Dampers and Containment Isolation Valves do not Meet Technical Specification Engineered Safety Feature Response Time Surveillance Requirements (Section M1.3)
50-334/97-27	LER	Missed Surveillance - Refueling Water Storage Tank Boron Concentration (Section M1.3)
50-334/97-28	LER	Spent Fuel Pool Crane Interlocks and Physical Stops not Tested Prior to Use in Accordance with Technical Specifications (Section M1.3)
50-334/97-29	LER	De-energized Chart Recorder Leads to Missed Refueling Water Storage Tank Level Channel Check Surveillance (Section M1.3)
50-334/97-30	LER	Failure to Comply with Emergency Diesel Generator Technical Specification Action Statement (Section M1.3)
50-334/97-34	LER	Residual Heat Removal System Technical Specification Requirements Historically not Satisfied During Refueling Cavity Draining (Section M1.3)
50-334/97-36	LER	Inadequate Channel Check for Meteorological Monitoring Instrumentation (Section M1.3)
50-334/97-37	LER	Condition Prohibited by Technical Specifications - Inadequate Solid State Protection System Logic Testing (Section M1.3)
50-334/97-40	LER	Inadequate Testing of Reactor Protection System P-8 Interlock Due to Solid State Protection System Semi-Automatic Tester Design Error (Section M1.3)
50-334/97-43	LER	Inadequate Surveillance Testing of Solid State Protection System Resulted in Entry into Technical Specification 3.0.3 (Section M1.3)

50-334/98-01	LER	Failure to Perform Required Valve Surveillance for Component Cooling and Service Water as Required by Technical Specification (Section M1.3)
50-334/98-03	LER	Failure to Perform Chemical Addition System Valve Cycling Surveillance as Required by Technical Specifications (Section M1.3)
50-334/98-04	LER	Failure to Perform Required Valve Surveillances for Boron Injection, ECCS and Quench Spray as Required by Technical Specifications (Section M1.3)
50-334/98-05	LER	Failure to Comply with the Surveillance Requirements for Boron Injection Tank Surge Tank Boron Concentration (Section M1.3)
50-334/98-06	LER	Inadequate Routine Weekly Surveillance Testing of Onsite A.C. Power Distribution System (Section M1.3)
50-334/98-07	LER	Failure to Inspect Emergency Diesel Generators in Accordance with Technical Specifications (Section M1.3)
50-334/98-08; & 50-334/98-08-01	LER	Failure to Test Emergency Diesel Generator Trip Bypass in Accordance with Technical Specifications (Section M1.3)
50-334/98-09	LER	Failure to Perform Required Ventilation Filter Bank Testing as Required by Technical Specifications (Section M1.3)
50-334/98-10	LER	Condition Prohibited by Technical Specifications - Inadequate Compliance to Action Statement During Instrument Testing (Section M1.3)
50-334/98-11; & 50-334/98-11-01	LER	PORV Technical Specifications Surveillance Requirements (Section M1.3)
50-334/98-13	LER	RCS Loop Stop Valves Limit Switch Interlocks not Tested in Accordance with Technical Specifications (Section M1.3)
50-334/98-14; & 50-334/98-14-01	LER	Failure to Comply with Technical Specification Surveillance Requirement 4.4.9.2.3 (Section M1.3)
50-334/98-15	LER	Inadequate Performance of Channel Functional Tests (Section M1.3)

50-334/98-17	LER	Inadequate Surveillance Requirement Testing of Accident and Remote Shutdown Monitoring Instrumentation (Section M1.3)
50-334/98-18 50-334/98-18-01	LER	Inadequate Beaver Valley Power Station Unit 1 Procedures to Ensure Compliance with Technical Specifications (Section M1.3)
50-334/98-19	LER	Routine Technical Specification (TS) Surveillance of Swing Load Interlocks for Emergency Diesel Generator Loading not Performed and Failure to Comply with TS Action Statement when Identified (Section M1.3)
50-334/98-20 50-334/98-20-01	LER	Use of Non-calibrated Computer Points for Satisfying Technical Specification Surveillances (Section M1.3)
50-334/98-23	LER	Reactor Coolant Pump Bus Under Voltage and Under Frequency Relay Channel Functional Testing Inadequacies (Section M1.3)
50-334/98-25	LER	Condition Prohibited by Technical Specifications: Incore thermocouples and RTDs Not Calibrated per Definition (Section M1.3)
50-334/98-26 50-334/98-26-01	LER	Failure to Perform Inservice Testing of RHR and CCR Valves as Required by Technical Specifications (Section M1.3)
50-334/98-27	LER	Inadequate Interpretation of Technical Specification Causing Inadequate System Surveillance (Section M1.3)
50-412/97-04 and 50-412/97-04-01 50-412/97-04-02	LER	Four Containment Isolation Valves not Tested in Accordance with Technical Specifications (Section M1.3)
50-412/97-05	LER	Conditions Prohibited by Technical Specifications During Routine 4.16 kV and 480 Volt Emergency Bus Surveillance Testing (Section M1.3)
50-412/97-09	LER	Missed Surveillance of the Gaseous Waste Storage Tank Radioactive Material Quantity Determination (Section M1.3)
50-412/98-01	LER	Failure to Perform Surveillance Testing of Containment Isolation Spring Loaded Check Valve as Required by Technical Specification 4.6.3.1.2.e (Section M1.3)

50-412/98-02	LER	Inadequate Testing of Diesel Fuel Oil Transfer Pumps as Required by Technical Specifications (Section M1.3)
50-412/98-03	LER	Failure to Perform PORV Limit Switch Position Indicator Calibration as Required by Technical Specification Requirement 4.3.3.8.4 (Section M1.3)
50-412/98-04	LER	Condition Prohibited by Technical Specifications - P-9 Interlock not Tested Due to Design Inadequacy (Section M1.3)
50-412/98-07 and 50-412/98-07-01 50-412/98-07-02	LER	Inadequate Beaver Valley Power Station Unit 2 Procedures to Ensure Compliance with Technical Specifications (Section M1.3)
50-412/98-09	LER	Inadequate Testing of Unit 2 PORV Technical Specification Surveillance Requirements (Section M1.3)

LIST OF ACRONYMS USED

ALARA	As Low As Is Reasonably Achievable
BCO	Basis for Continued Operation
BVOP	Beaver Valley Oversight Panel
CATS	Corrective Action Tracking System
CCR	Component Cooling, Reactor
CFR	Code of Federal Regulations
dc	Direct Current
DCP	Design Change Package
EA	Enforcement Action
EDG	Emergency Diesel Generator
EM	Engineering Memorandum
ES	Engineering Standard
FRV	Feedwater Regulating Valve
GL	Generic Letter
HHSI	High Head Safety Injection
IPTE	Infrequently Performed Test or Evolution
LCO	Limiting Condition of Operation
LER	Licensee Event Report
MPFF	Maintenance Preventable Functional Failure
MRSC	Maintenance Rule Steering Committee
MWR	Maintenance Work Request
NCV	Non-Cited Violation
NED	Nuclear Engineering Department
NO	Nuclear Operator
NPDAP	Nuclear Power Division Administrative Procedure
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulations
NSS	Nuclear Shift Supervisor
OM	Operating Manual
OMCN	Operating Manual Change Notice
OST	Operational Surveillance Test
PDR	Public Document Room
PM	Preventive Maintenance
PRA	Probablistic Risk Assessment
QA	Quality Assurance
QS	Quench Spray
RAP	Restart Action Plan
RCS	Reactor Coolant System
RP	Radiological Protection
RS	Recirculation Spray
RW	River Water
RWP	Radiation Work Permit
RWST	Refueling Water Storage Tank
SG	Steam Generator
SI	Safety Injection
SSC	Safety Related Systems, Structures, and Components

STAR	Stop, Think, Act, and Review
SW	Service Water
TAGMNO	Technical Assistant to the Generator Manager of Nuclear Operations
TER	Technical Evaluation Report
TM	Temporary Modification
TOP	Temporary Operating Procedure
TS	Technical Specification
TSST	Technical Specification Surveillance Testing
UFSAR	Updated Final Safety Analysis Report
VCT	Volume Control Tank
VIO	Violation