UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
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KING OF PRUSSIA, PA 19406-1415

August 1, 2011

Mr. Paul A. Harden
Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
P. O. Box 4, Route 168
Shippingport, PA 15077-0004

SUBJECT: BEAVER VALLEY POWER STATION–NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000334/2011007 AND 05000412/2011007

Dear Mr. Harden:

On June 17, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Beaver Valley Power Station (BVPS), Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on June 17, 2011, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. In conducting the inspection, the team examined the adequacy of selected components to mitigate postulated transients, initiating events, and design basis accidents. The inspection involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

This report documents three NRC-identified findings that were of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of the very low safety significance and because they were entered into your corrective action program, the NRC is treating these as non-cited violations (NCV), consistent with Section 2.3.2 of the NRC's Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at BVPS.

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Sincerely,

Lawrence T. Doerflein

Lawrence T. Doerflein, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-334, 50-412
License No. DPR-66, NPF-73

Enclosure:
Inspection Report 05000334/2011007 and 05000412/2011007
w/Attachment: Supplemental Information

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/RA/

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REGION I

Docket Nos.:	50-334, 50-412
License Nos.:	DPR-66, NPF-73
Report No.:	05000334/2011007, 05000412/2011007
Licensee:	FirstEnergy Nuclear Operating Company (FENOC)
Facility:	Beaver Valley Power Station, Units 1 & 2
Location:	Shippingport, PA
Dates:	May 23 – June 17, 2011
Inspectors:	K. Mangan, Senior Reactor Inspector, Team Leader F. Arner, Senior Reactor Inspector J. Ayala, Reactor Inspector M. Young, Reactor Inspector M. Yeminy, NRC Mechanical Contractor G. Skinner, NRC Electrical Contractor
Approved by:	Lawrence T. Doerflein, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000334/2011007, 05000412/2011007; 05/23/2011 – 06/17/2011; Beaver Valley Power Station; Component Design Bases Inspection.

The report covers the Component Design Bases Inspection conducted by a team of four NRC inspectors and two NRC contractors. Three findings of very low risk significance (Green) were identified, which were considered to be non-cited violations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The team identified a finding of very low safety significance involving a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, "Design Control" because FENOC did not verify or check the adequacy of the Unit 1 emergency diesel generator (EDG) fuel oil transfer system design. Specifically, FENOC did not ensure adequate net positive suction head (NPSH) for the fuel oil transfer pumps during worst case design conditions, and did not evaluate the effect air voids in the suction piping would have on the pumps. FENOC entered the issue into the corrective action program, and performed testing on the fuel oil transfer system and consulted with the pump vendor to determine if the design of the system was adequate. Following completion of the testing and new calculations, FENOC determined that the pumps were operable but degraded.

  The team determined that the issue was more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Design Control and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was of very low safety significance (Green) because it was a design deficiency confirmed not to result in a loss of operability or functionality. The team determined that there was not a crosscutting aspect associated with this finding because it was not indicative of current performance. (1R21.2.1.2)

- Green. The team identified a finding of very low safety significance involving a non-cited violation of 10 CFR 50, Appendix B, Criterion III, "Design Control," because FENOC did not correctly translate the design basis of the electrical distribution system into procedures to ensure operability of offsite power during bus transfers when operating the system service station transformer (SSST) load tap changers (LTC) in the manual mode, an allowed system configuration. Specifically, the team found that procedure's supporting calculation did not evaluate the voltage levels on the 480 volt buses. The team determined that during some design basis events, with the tap changer in manual, voltage on the 480 volt vital bus could degrade to a level that would cause the degraded grid relays to trip, resulting in a spurious trip of offsite power. FENOC entered the issue into the corrective action program, and implemented an Operation's night order to ensure the LTC was maintained in automatic.

The team determined that the issue was more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Design Control, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was of very low safety significance (Green) because it was a design deficiency confirmed not to result in a loss of operability or functionality. The team determined that there was not a crosscutting aspect associated with this finding because it was not indicative of current performance. (1R21.2.1.5)

- Green. The team identified a finding of very low safety significance involving a non-cited violation of 10 CFR 50, Appendix B, Criterion III, "Design Control," because FENOC did not perform adequate voltage calculations to verify that vital bus voltage levels would be adequate when offsite power was the bus voltage source. The team determined that non-conservative assumptions and evaluations caused the calculation results to predict higher bus voltage levels than could actually occur. Specifically, the team found that FENOC's calculational assumptions related to the initial tap position of the SSSTs following bus transfers, evaluation of the effect of the voltage dips that occur during a fast bus transfer, and assumptions for the post event grid voltage condition following the main generator trip could be worse than assumed in the calculation. FENOC entered the issue into the corrective action program, and revised calculations and evaluated post event grid voltage conditions to verify the adequacy of the offsite power source.

  The team determined that this issue was more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Design Control, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was of very low safety significance (Green) because it was a design deficiency confirmed not to result in a loss of operability or functionality. The team determined that there was not a crosscutting aspect associated with this finding because it was not indicative of current performance. (1R21.2.1.7)

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, Barrier Integrity

1R21 Component Design Bases Inspection (IP 71111.21) (samples 18)

.1 Inspection Sample Selection Process

The team selected risk significant components for review using information contained in the Beaver Valley Power Station (BVPS) Probabilistic Risk Assessment (PRA) and the U.S. Nuclear Regulatory Commission's (NRC) Standardized Plant Analysis Risk (SPAR) model. Additionally, the Beaver Valley Power Station, Units 1 and 2, Significance Determination Process (SDP) Phase 2 Notebook was referenced in the selection of potential components for review. In general, the selection process focused on components that had a Risk Achievement Worth (RAW) factor greater than 1.3 or a Risk Reduction Worth (RRW) factor greater than 1.005. The team also considered previously identified industry operating experience issues and component contribution to large early release frequency (LERF) in the selection of components for review. The components selected were located within both safety-related and non-safety related systems, and included a variety of components such as pumps, breakers, heat exchangers, electrical buses, transformers, and valves.

The team reviewed a list of components based on the risk factors previously mentioned. Additionally, the team reviewed the previous component design bases inspection reports (05000334/05000412, 2006-008 and 05000334/05000412, 2008-008) and excluded those components previously inspected. The team then performed a margin assessment to narrow the focus of the inspection to 18 samples consisting of 15 components, and 3 operating experience reviews. The components selected included a main steam isolation valve for LERF implications. The team's evaluation of possible low design margin included consideration of original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition/equipment reliability issues. The assessment also included items such as failed performance test results, corrective action history, repeated maintenance, maintenance rule status, operability reviews for degraded conditions, NRC resident inspector insights, system health reports, and industry operating experience. Finally, consideration was also given to the uniqueness and complexity of the design.

The inspection performed by the team was conducted as outlined in NRC Inspection Procedure (IP) 71111.21. This inspection effort included walkdowns of selected components, interviews with operators, system engineers and design engineers, and reviews of associated design documents and calculations to assess the adequacy of the components to meet design basis, licensing basis, and risk-informed beyond design basis requirements. A summary of the reviews performed for each component and operating experience sample, and the specific inspection findings identified are discussed in the subsequent sections of this report. Documents reviewed for this inspection are listed in the Attachment.

.2 Results of Detailed Reviews

.2.1 Results of Detailed Component Reviews (15 samples)

.2.1.1 Unit 1 Turbine Driven Auxiliary Feedwater Pump

a. Inspection Scope

The team inspected the Unit 1 turbine driven auxiliary feed water (TDAFW) pump to verify it was capable of responding to design basis events. The team reviewed the Updated Final Safety Analysis Report (UFSAR), test data, system health reports, the vendor manual, and operating and surveillance procedures. The team performed the review to identify the design, maintenance, and operational requirements related to the turbine steam supply and speed control, the system flow rate, and the pump flow rate, developed head, net positive suction head (NPSH), and minimum flow. These requirements were reviewed for pump operation with the source of water originating from the demineralized water storage tank. Design calculations, as well as documentation of periodic surveillance test results, were also reviewed to verify that design performance requirements were met. The team reviewed the maintenance history, corrective action documents, and design change documentation to assess the potential for component degradation and determine if changes to the pump impacted design margins or performance. The team evaluated the adequacy of the TDAFW pump suction piping regarding its vulnerability to over-pressurization due to back flow from the pump discharge check valve. The team also evaluated if the acceptable check valve leak rate could cause reverse rotation of the pump. In addition, the team walked down portions of the TDAFW pump and associated piping systems to verify that the installed configuration was consistent with design bases information and to assess the material condition of the pump.

b. Findings

No findings were identified.

.2.1.2 Unit 1 Emergency Diesel Generator – Mechanical (A EDG)

a. Inspection Scope

The team inspected the Unit 1 'A' emergency diesel generator (EDG) mechanical systems to verify they were capable of responding to design basis events. The team reviewed the UFSAR, Technical Specification (TS), and design bases documents (DBD) to gain an overall understanding of the design bases of the EDG air start system, and the fuel oil supply system. Design calculations and procedures were reviewed to verify that the design bases requirements and design assumptions had been appropriately translated into these documents. The team reviewed system modifications to verify that the modifications did not degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. Component walkdowns were conducted to verify that the installed configurations would support their design bases function under accident conditions, and had been maintained consistent with design assumptions. The team also witnessed the performance of inservice test of a fuel oil transfer pump (FOTP) to evaluate the adequacy of the test procedure. Test procedures and results were reviewed against the design bases requirements to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents in order to ensure component operation during design basis accident conditions. Finally, system health reports, the preventive and corrective maintenance history, and corrective action system documents were reviewed to determine if potential degradation was being properly monitored or prevented, and that component rework and replacement was consistent with equipment qualification life.

b. Findings

Introduction: The team identified a Green non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, "Design Control," because FENOC did not verify or check the adequacy of the Unit 1 EDG fuel oil transfer system design. Specifically, FENOC did not ensure adequate NPSH for the pumps during worst case design conditions, and did not evaluate the effect air voids in the suction piping would have on the pumps

Description: The team reviewed the configuration of the suction piping of the FOTPs both by drawing reviews and system walkdowns. The team determined that FOTPs were located above the fuel oil storage tanks (FOST) with a significant pipe run between the pumps and the FOST. Additionally, as part of the walkdown the team witnessed the inservice test of the fuel oil transfer pump and questioned whether the suction piping was full of fuel oil because the team observed indications of air passing through the pump. The team requested FENOC's evaluation of NPSH available for the FOTPs and NPSH required for the pumps. The team also requested FENOC determine if there was air in the suction piping and provide any vendor data that showed the pump had self-priming (ability to pump air) capabilities.

FENOC provided the pump test curve to the team which stated the pump's NPSH required was 15 feet. FENOC also contacted the pump vendor to verify the actual NPSH required for the pump. The vendor's report established a new NPSH required for the pump of 10.28 feet of oil. However, FENOC found they did not have a calculation that determined the NPSH available for the pumps. FENOC also determined that a test had not been performed demonstrated the NPSH design requirement which would have established the capability of the FOTP to take suction from a near empty FOST. To address the deficiency FENOC developed a calculation for NPSH available to the pumps based on the installed configuration and actual field conditions. The calculation determined the lowest available NPSH was 10.91 feet. The team noted the values were based on actual field conditions versus worst case design conditions, and included as tested pump flow rates instead of maximum flow rates and clean suction strainers instead of worst case strainer blockage levels. FENOC also performed pump testing to determine the actual dynamic head loss in the suction piping. The NPSH available at the pump was determined by evaluated suction pressure readings taken during the test. The evaluation showed that the NPSH assessment calculations were conservative compared to the test values. Based on the testing, calculations and revised vendor information, FENOC concluded that the equipment was operable but degraded and that formal design calculations would be required to ensure the adequacy of the design.

To address the team's concern about the potential of air in the suction piping, FENOC performed ultrasonic testing of the piping and found that portions of the pipe were empty (air voided). However, the piping adjacent to the pump had remained full. Following the confirmation of the air in the suction piping the team questioned the capability of the pump to lift the oil from the tank during the worst case design requirement. The team determined that this could require a 21 foot self-priming capability assuming the suction piping was completely empty. The team's review of the pump manufacturer's information noted that the pump had some capability to self-prime but determined that this capability had not been tested. Additionally, the manufacturer stated that the pump must be run with a wet suction. To determine the operability of the EDGs FENOC performed additional testing on the fuel oil system. The testing was performed to assess if the pump would be capable of removing the air that would accumulate in suction piping during an event that would required an extended run of the EDGs. Previous surveillance testing of the system had demonstrated that when the FOST was full the FOTP would be able to clear the air from the piping. Based on the surveillance tests and the additional testing performed FENOC concluded that the pumps were operable but the system was degraded.

The team reviewed the analyses performed on the pump suction piping for both the NPSH and air voiding concerns and determined FENOC's assessment of the system was reasonable.

Analysis: The team determined that FENOC's failure to verify that the NPSH available and that the quantity of air in the FOTP suction piping would not exceed the design requirements of the pumps was a performance deficiency. The performance deficiency was determined to be more than minor because it was similar to Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," Appendix E, Example 3j, because the failure to perform these evaluations resulted in a reasonable doubt on the operability of the FOTP. Additionally, the performance deficiency was associated with the Mitigating System Cornerstone attribute of design control, and adversely affected the cornerstone objective ensuring the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the deficiencies resulted in a reasonable doubt that the fuel oil transfer pumps could deliver the volume of the fuel oil required to satisfy EDG operational requirement. In accordance with NRC IMC 0609.04, "Initial Screening and Characterization of Findings", the team conducted a Phase 1 Significance Determination Process (SDP) screening and determined the finding to be of very low safety significance (Green) because it was a design deficiency confirmed not to result in the loss of operability or functionality. The team did not identify a cross-cutting aspect with this finding because it did not represent current performance. The lack of a NPSH calculation was an old design issue, and the testing procedure was developed outside the timeframe which reflected current performance.

Enforcement: 10 CFR 50 Appendix B, Criterion III, Design Control states in part that the design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to the above, prior to June 23, 2011, FENOC did not verify the suction design requirements for the Unit 1 EDG FOTPs were met during worst case design conditions. Specifically, FENOC did not ensure adequate NPSH for the pumps, and did not evaluate the effect air voids in the suction piping would have on the pumps. Because this finding is of very low safety significance and because it was entered into the licensee's corrective action program (condition reports (CR) 11-96157, and 11-96435), this violation is being treated as an NCV, consistent with the NRC Enforcement Policy. **(NCV 05000334/2011007-001, Failure to Verify the Design Requirements for the Fuel Oil Transfer Pumps)**

2.1.3 Unit 2 Power Operated Relief Valves (455C, 455D and 456)

a. Inspection Scope

The team inspected the Unit 2 power operated relief valves (PORV) to determine if a common cause failure of the valves could prevent them from responding to design basis events. The team reviewed the UFSAR, TS, and applicable plant calculations to identify the design bases requirements of the PORVs. The team examined records of surveillance testing and maintenance activities, and applicable corrective actions to verify that potential degradation or low margin design issues were being monitored, prevented or corrected. Additionally, the team reviewed operating and off-normal response procedures to verify that design basis requirements had been adequately translated into procedures and instructions. The team also reviewed station emergency operating procedures for a postulated design event to verify that PORV use and operation would be consistent with accident analysis assumptions evaluated in the UFSAR. Finally, the team reviewed calculations performed for the qualification of the PORV discharge piping, and maintenance records and drawings to verify that the support function provided to the PORVs was consistent with design requirements.

b. Findings

No findings were identified.

.2.1.4 Unit 2 Service Water Check Valve (2SWS112)

a. Inspection Scope

The team inspected the Unit 2 service water (SW) check valve (2SWS112) to verify that it was capable of meeting its design basis requirements. The team reviewed the UFSAR, drawings, the vendor manual, and procedures to identify the design basis requirements of the check valve. The check valve testing procedures and SW system hydraulic analyses were reviewed to verify the design basis requirements were appropriately incorporated into the test acceptance criteria. The team reviewed a sample of test results to verify the acceptance criteria were met. The team reviewed the corrective and preventive maintenance history of the check valve to gain an understanding of the component performance history and overall component health, and evaluate if the check valve was properly maintained. Finally, corrective action documents and system health reports were reviewed to verify deficiencies were appropriately identified and resolved.

b. Findings

No findings were identified.

.2.1.5 Unit 2 4160 Vac Vital Bus (2AE)

a. Inspection Scope

The team inspected the 4160 Vac vital bus (2AE) to verify it was capable of performing its design basis function. The team reviewed the UFSAR, DBDs and electrical distribution calculations including load flow, voltage drop, short-circuit and electrical protection coordination. This review was performed to verify the adequacy and appropriateness of design assumptions, to verify that bus capacity was not exceeded, and to determine if bus voltages remained above minimum acceptable values under design basis conditions. The team reviewed the design and test results for automatic and manual transfers of AC power sources to verify that they satisfied the design basis timing and voltage requirements. The team also reviewed the electrical overcurrent, undervoltage and ground protective relay settings for selected circuits to verify that the trip setpoints would not interfere with the ability of the supplied equipment to perform its safety function as assumed in the design basis while ensuring the trip setpoints provided for adequate bus protection. The loss of voltage and degraded voltage relay surveillances, calibration results, and setpoint calculations were also reviewed to verify that they satisfied the requirements of the associated TSs. The control logic design drawings of the 4kV supply breaker to vital bus 2AE were reviewed to verify adequate breaker closing and opening circuit interlocks. The team also reviewed system maintenance test results, interviewed system engineers and conducted field walkdowns to verify that equipment alignment, nameplate data, and breaker positions were consistent with design drawings, and to assess the material condition of the bus. Finally, the team reviewed calculations and procedures for a loss of switchgear room ventilation event. The review was performed to determine whether the established procedure would provide adequate temporary cooling to the switchgear.

b. Findings

.1 Introduction: The team identified a violation of very low safety significance (Green) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because FENOC did not correctly translate the design basis of the electrical distribution system into procedures to ensure operability of offsite power during bus transfers when operating the system service station transformer (SSST) load tap changers (LTC) in the manual mode. Specifically, the calculations supporting the procedure did not evaluate voltages on the 480V buses, and the impact of the 480V degraded voltage relay.

Description: The team noted that the BVPS Unit 2 UFSAR, Section 8.2.2.1, states that the offsite power systems are designed with sufficient independence, capacity, and capability to meet the requirements of GDC 17. The team noted GDC 17 states, in part, that an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety, and that the safety function of the system shall be to provide sufficient capacity and capability. Additionally, provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit.

The team reviewed procedure 2OST-36.7, "Offsite to Onsite Power Distribution System Breaker Alignment Verification," which allowed offsite power to be considered operable when the LTC was placed in manual mode provided the potential transformer (PT) meter readings of 122.5V to 126.0V were maintained. The team reviewed FENOC calculation 8700-E-068, "Station Service Load Flow and Voltage Profile Analysis," that had been used to determine that the plant could be operated with the LTC in this configuration with tap settings between 102.2% and 105.5% (121.47V to 125.39V PT meter reading). The team determined the calculation addressed the voltage transient on the 4160 Vac bus. However, the team's review of the BVPS electrical distribution system features found that degraded voltage relays (DVR) were installed on both the 4160 Vac and the 480 Vac safety-related buses. Additionally, the team noted that the 480 Vac DVRs would trip the upstream 4160 Vac bus from the offsite power supply on a sustained degraded voltage. The team requested the analysis for the 480 Vac buses that demonstrated that with the LTC in manual, offsite power would not separate from the vital buses following a design basis event.

The team reviewed calculation 8700-E-271, "Station Service System Dynamic Stability Study," that determined that during accident conditions, following the main generator trip and fast bus transfer from the unit service station transformer (USST) to the SSST, voltage on the 480V buses could decline to approximately 90%. Therefore, the 480 Vac bus voltage would dip below the DVR dropout setpoint of 92.5%. As a result, automatic SSSTs LTC movement would be required to raise voltage above the DVR relay reset setpoint of 95.5% prior to the expiration of the DVR time delay in order to prevent a spurious separation from the offsite power source. The team concluded that the settings provided in the procedure were not sufficient to preclude grid separation in case of an accident when the LTC was in manual.

In response to the team's concern, FENOC implemented Operations night orders requiring the LTCs to be in "Auto" to consider the offsite power source to be operable. FENOC also reviewed operations logs for the last three years to determine whether LTCs had been placed in manual position, in order to assess past operability. The licensee determined that the LTC had been placed in the manual mode for approximately three hours on April 27, 2010, for calibration of the LTC relay. However, since the associated 4160V bus had been aligned to the SSST during the activity, not the USST, the 480V buses would not have been subject to the low voltage associated with the bus transfer. Therefore, the offsite power supply remained operable.

Analysis: The team determined that the failure to perform adequate calculations for placing the SSST LTCs in manual mode to ensure offsite power operability was a performance deficiency. The performance deficiency was determined to be more than minor because it was similar to Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," Appendix E, Example 3j, because the failure to perform these evaluations resulted in a reasonable doubt on the operability of the offsite power supply. Additionally, the performance deficiency was associated with the Mitigating Systems

Cornerstone attribute of Design Control, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. In accordance with NRC IMC 0609.04, "Initial Screening and Characterization of Findings", the team conducted a Phase 1 Significance Determination Process (SDP) screening and determined the finding to be of very low safety significance (Green) because it was a design deficiency confirmed not to result in the loss of operability or functionality. The team did not identify a cross-cutting aspect with this finding because it did not represent current performance. The inadequate calculation was developed outside the timeframe which reflected current performance.

Enforcement: 10 CFR 50, Appendix B, Criterion III, "Design Control" requires, in part, that design control measures ensure that the applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, prior to June 10, 2011, FENOC did not correctly translate the design basis of the electrical distribution system into procedures to ensure operability of offsite power during bus transfers when operating the system service station transformer load tap changers in the manual mode. Specifically, the calculations supporting the procedure did not evaluate voltages on the 480V buses, and potential actuation of the 480V degraded voltage relay, which would result in a spurious grid separation during an event. Because this violation was of very low safety-significance and because the issue was entered into the licensee's corrective action program (CR 11-96222), this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000412/2011007-02, Inadequate Calculations for Placing SSST LTC in Manual Mode)**.

.2 Unresolved Item: The team identified an Unresolved Item (URI) regarding the adequacy of the BVPS degraded voltage protection scheme. The existing degraded voltage relay time delay of 90 ± 5 seconds does not appear to be consistent with the assumption in the UFSAR accident analysis for safety injection flow. The team found that Technical Specification Table 3.3.5-1, "Loss of Power Diesel Generator Start and Bus Separation Instrumentation," Items 3 and 4, lists the degraded voltage relay time delay setpoint as 90 ± 5 seconds. However, the team noted that NRC letter dated June 2, 1977, sent to holders of operating licenses requiring the installation of degraded voltage relays, to ensure safety-related loads had sufficient voltage to respond to an accident, stated in Position B.1.c that, "The allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the FSAR accident analysis." The NRC safety evaluation report (SER) dated March 3, 1982, concluded that the proposed maximum time delay of 95 seconds "does not exceed this maximum time delay." However, the team found that UFSAR Table 14.3.2-8 shows a time delay of ≤ 17 seconds for safety injection flow with offsite power, and ≤ 27 seconds for a loss-of-offsite power/loss-of-coolant accident (LOOP/LOCA). The team was concerned that if offsite source voltage was degraded below the level where it was capable of performing its accident mitigation function, but not so low as to actuate the fast acting loss of voltage relays, the time delay assumptions in the accident analysis would not be satisfied. FENOC entered the apparent inconsistency between the design accepted in the 1982 SER and the criteria stated in the 1977 letter into the corrective action program (CR 11-95145) for evaluation and resolution. The item was considered unresolved pending NRC review of FENOC actions to address the inconsistency. **(URI 05000334;05000412/2011007-03, Degraded Voltage Relay Time Delay)**

.2.1.6 Unit 2 4160 Vac to 480 Vac Transformer (2-8N)

a. Inspection Scope

The team inspected the 4160 Vac to 480 Vac transformer (2-8N) to verify it was capable of performing its design basis function. The team reviewed the system one-line diagram, nameplate data and design basis descriptions to verify that the loadings on 480 Vac substation transformer and the associated 4160 Vac and 480 Vac circuit breakers were within the corresponding transformer and switchgear design ratings. The team reviewed the design assumptions and calculations related to the short-circuit currents, voltage drops and protective relay settings associated with the equipment to verify that output voltage was adequate and the settings were appropriate to meet design requirements. The team also reviewed a sample of completed maintenance activities and functional verification test results to verify that the high and low voltage cable feeders had sufficient capacity to supply the current and voltage requirements of the 480 Vac substation during normal and accident conditions. Finally, the team reviewed condition reports written during the last three years to assess the adequacy of corrective actions taken to address identified discrepancies.

b. Findings

No findings were identified.

2.1.7 Unit 2 480 Vac Vital Bus (2N)

a. Inspection Scope

The team inspected the 480 Vac vital bus (2N) to verify it was capable of performing its design basis function. The team reviewed the UFSAR, DBDs and electrical distribution calculations including load flow, voltage drop, short-circuit and electrical protection coordination. This review evaluated the adequacy and appropriateness of design assumptions; and verified that bus capacity was not exceeded and bus voltages remained above minimum acceptable values under design basis conditions. The team reviewed the electrical overcurrent, undervoltage and ground protective relay settings for selected circuits to verify that the trip setpoints would not interfere with the ability of the supplied equipment to perform its safety function as assumed in the design basis while ensuring the trip setpoints provided for adequate bus protection. The degraded voltage relay surveillances, calibration results, and setpoint calculations were also reviewed to verify that they satisfied the requirements of the associated TSs. The control logic design drawings of the 4kV supply breaker to vital bus 2N were reviewed to verify adequate breaker closing and opening circuit interlocks. Finally, the team reviewed system maintenance test results, interviewed system engineers and conducted field walkdowns to verify that equipment alignment, nameplate data, and breaker positions were consistent with design drawings, and to assess the material condition of the bus.

b. Findings

Introduction: The team identified a violation of very low safety significance (Green) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because FENOC did not perform adequate calculations to verify offsite power would provide sufficient voltage to the safety-related loads during a design basis event. Specifically, the team determined that non-conservative assumptions and evaluations in the calculations resulted in higher bus and component voltage levels than may actually be present.

Description: The team reviewed FENOC's evaluation for voltage levels available to the safety-related buses when the buses were being supplied by the offsite grid during design basis events. The team also reviewed the calculations that determined these voltage levels would provide adequate voltage to safety-related equipment supplied by the bus. The team's review determined that FENOC had developed calculations that assessed the transient voltage and post event steady state voltage conditions to the loads on the 4kv and 480 volt buses. The team used these calculations to determine if this was the worst case voltage transient that would occur during a design basis event in which offsite power would remain connected to the bus.

Following a review of the calculations, the team identified several concerns related to the assumptions in the calculations and the evaluation of the results. Specifically, the team questioned the basis for the minimum grid voltage level assumed in the calculation throughout the event, the effects of the voltage dip that occurs during the fast-bus transfer, and the basis for the assumed initial position of the LTC on the system service station transformers (SSSTs) following bus transfers.

In response to the teams' concerns, FENOC reviewed their agreement with the grid operator and concluded that lower voltage conditions than assumed in the calculation could occur because the agreement specified that a 4-6% voltage drop would be acceptable at the 138kV and 345kV systems following the trip of a BVPS unit. As a result, FENOC determined that following a unit trip, during a design basis event, voltage levels could challenge the degraded voltage protection or operation of safety-related equipment. FENOC discussed the potential for a post event grid voltage drop with the grid operator and the grid operator provided data that showed, because of the current availability of local generation capacity, a trip of a BVPS unit would not result in a grid voltage decrease. Based on the data, FENOC concluded that existing operating conditions did not present a current operability concern but revisions to the calculations and/or agreement with the grid operator would be required.

Additionally, FENOC reviewed their evaluation for the transient voltage during the fast transfer and determined that an evaluation of the adequacy of voltage to running equipment had not been performed. In order to address the team's concern, FENOC reviewed previously performed fast transfer test data and found that the maximum fast-transfer time in the test data was less than 6 cycles. FENOC provided a bounding calculation for a 6-cycle transfer time that showed the minimum voltage reached during the voltage dip was approximately 63%. FENOC then provided a calculation to the team that had analyzed running equipment under similar voltage conditions that occur during emergency diesel generator loading. This evaluation determined that a brief power interruption to the loads would not have an unacceptable effect on response times, and would not result in operation of over-current protective devices.

Finally, FENOC reviewed the assumed LTC position in their calculation and determined that, because the SSSTs are normally unloaded prior to an event, the LTC would be in a lower position than assumed in the calculation. The team determined that following the transfer, the SSST LTC would remain in its lower (buck) position for 30 seconds. FENOC determined that voltage levels would be approximately 2.5% lower than previously evaluated in calculations for the voltage levels at the 480V bus. Subsequently, FENOC evaluated loads on the 480 volt bus at the reduced voltage to verify that adequate voltage was available to downstream equipment and concluded that the lower voltage levels would not cause failures of system or component needed to respond to design basis accident.

The team reviewed the revised data, calculations, and evaluations and determined that FENOC's conclusion, that the updated information provided assurance of operability for offsite power for all design basis events, was reasonable.

Analysis: The team determined that the failure to perform adequate voltage calculations, to demonstrate the availability of offsite power was a performance deficiency. The performance deficiency was more than minor because it was similar to Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," Appendix E, Example 3j, because the failure to adequately perform these evaluations resulted in a reasonable doubt on the operability of offsite power. Additionally, the finding was associated with the Mitigating Systems Cornerstone attribute of Design Control, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, there was reasonable doubt as to whether the safety-related equipment would have adequate voltage to perform their safety function during design basis events. In accordance with NRC IMC 0609.04, "Initial Screening and Characterization of Findings," the inspectors conducted a Phase 1 Significance Determination Process (SDP) screening and determined the finding to be of very low safety significance (Green) because it was a design deficiency confirmed not to result in the loss of operability or functionality. The team did not identify a cross-cutting aspect with this finding because it did not represent current performance. The inadequate calculation was developed outside the timeframe which reflected current performance.

Enforcement: 10 CFR 50, Appendix B, Criterion III, "Design Control" requires, in part, that design control measures provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of suitable testing program. Contrary to the above, prior to June 10, 2011, FENOC's design control measures did not verify the adequacy of voltage at the safety-related electrical buses following design basis events when supplied from the offsite grid. Specifically, non-conservative assumptions and evaluations in the applicable calculations resulted in higher bus and component voltage levels than may actually be present. Because this violation was of very low safety significance and because the issue was entered into the FENOCs corrective action program (CR 11-96495), this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000412/2011007-04, Offsite Power Non-Conservative Post Transient Voltage Calculations)**

.2.1.8 Unit 2 Residual Heat Removal Heat Exchanger Bypass Valve (1RH-MOV-605)

a. Inspection Scope

The team inspected the Unit 2 residual heat removal heat exchanger bypass motor-operated valve (MOV) (1RH-MOV-605) to verify it could meet its design function. The team reviewed the UFSAR, design basis documents, vendor manual, and procedures to identify the design basis requirements for the valve. The team performed a review of system operating procedures to assess whether component operation and alignments were consistent with design and licensing bases assumptions. Valve testing procedures and valve specifications were also reviewed to verify the design bases requirements, including worst case system and environmental conditions, were incorporated into the test acceptance criteria. The team reviewed periodic verification diagnostic test results and stroke test documentation to verify acceptance criteria were met, and that the valve's safety function, torque switch settings, performance capability, and design margins were adequately monitored and maintained. The review included verifying the valve analysis used the maximum differential pressure expected across the valve during worst case operating conditions. Additionally, corrective action documents and system health reports were reviewed to verify deficiencies were appropriately identified and resolved, and that the motor-operated valve was properly maintained.

The team also evaluated if the valve motor could perform the design function under worst case design conditions. The team reviewed motor data, electrical control and schematic diagrams, degraded voltage calculations, thermal overload settings, and voltage drop calculations to confirm that the motor-operated valve would have sufficient voltage and power available to perform its safety function at worst case degraded voltage conditions. Finally, the team interviewed the MOV program and design engineer to gain an understanding of maintenance issues and overall reliability of the valve.

b. Findings

No findings were identified.

.2.1.9 Unit 2 Main Steam Isolation Valve (2MSS-AOV101A)

a. Inspection Scope

The team inspected the Unit 2 'A' Main Steam Isolation Valve (MSIV) to verify it was capable of performing its design basis function. The team reviewed the UFSAR, design basis documents, vendor drawings, and procedures to identify the design basis requirements for the valve. The team performed a review of system and emergency operating procedures to assess whether component operation was consistent with design and licensing bases assumptions. Valve testing procedures and valve specifications were also reviewed to verify the design bases requirements, including worst case system conditions, were incorporated into the test acceptance criteria and component design analysis. The team reviewed periodic stroke time test results to verify acceptance criteria were met, and consistent with the licensing bases and accident analysis assumption for the safety-related close function. The team reviewed the setting of the MSIV open and closed limit switches and timing methodology in surveillance testing to ensure consistency with the licensing bases. The team reviewed the latest diagnostic test data to ensure that it was accurately translated into the actuator capability calculation and reviewed the safeguards time response test to ensure that the MSIV stroke time was accurately translated into the engineered safety features response time test.

The team reviewed design calculations to ensure that the total available thrust developed by the MSIV actuator was greater than the total required thrust for the most limiting design scenario. This review included an assessment of available margin, and a review of the acceptable spring preload to ensure it was reasonable. The team also compared the air supply pressure setpoint assumed in the design analysis to the MSIV setup control sheets to ensure that the setup requirements were consistent with the design analysis. The team reviewed the analysis which determined the maximum expected differential pressure for the valve to ensure that it was conservative for the transient main steam line break scenarios. The team performed a walkdown of the component to assess the condition of the MSIV and ensure that the air supply setpoint was consistent with the calculation assumptions. Finally, the team reviewed condition reports to assess the potential for component degradation and impact on design assumptions and valve performance.

b. Findings

No findings were identified.

.2.1.10 Unit 1 Low Pressure Safety Injection 1A Pump, (1SI-P-1A)

a. Inspection Scope

The team inspected the 1A low pressure safety injection (LPSI) pump to assess its ability to meet design basis head and flow requirements during design basis accidents. The team reviewed drawings, calculations, hydraulic analyses, procedures, DBDs, system health reports, preventive maintenance activities, and selected condition reports to evaluate whether the maintenance, testing, and operation of the 1A LPSI pump was adequate to ensure the pump performance would satisfy design basis requirements under accident conditions. The team verified that design inputs were properly translated into system procedures and tests, and reviewed completed surveillance tests to determine if pump bearing temperature, pump vibration and pump performance were consistent with acceptance criteria. The minimum operating point curve used in design calculations was also reviewed to ensure it was consistent with the maximum allowable pump degradation in surveillance tests. Finally, the licensing bases assumptions for cold leg and hot leg recirculation operation were reviewed to ensure consistency with emergency operating procedures and design analyses for maintaining NPSH.

The team reviewed the adequacy of water supply sources to the pump including an assessment of the potential for vortex conditions and the NPSH margin when the suction source was the containment sump. This included a review of the continuous void fraction assumption that was calculated at various points between the containment sump strainers and the LHSI pumps to ensure it was reasonable. The team also reviewed administrative procedures to ensure that assumptions in design calculations for minimum assumed containment sump levels at recirculation were reasonable including ensuring hatches in the refueling ring seal remain open during power operation. Finally, the team reviewed condition reports to assess the potential for component degradation and impact on pump performance design assumptions.

b. Findings

No findings were identified.

.2.1.11 Unit 2 High Head Safety Injection Pump (2CHS*P21B)

a. Inspection Scope

The team inspected the Unit 2 high head safety injection pump (2CHS*P21B) to assess its ability to meet design basis head and flow requirements for injection into the reactor coolant system during design basis events. The team reviewed drawings, calculations, hydraulic analyses, procedures, DBDs, system health reports, preventive maintenance activities, and selected condition reports to evaluate whether the maintenance, testing, and operation of the high head safety injection pump was adequate to ensure the pump performance would satisfy design basis requirements under transient and accident conditions. The team verified design inputs were properly translated into system procedures and tests, and reviewed completed surveillance tests to determine if the results adequately demonstrated pump operability. In addition, the team reviewed the adequacy of water supply sources to the pump including an assessment of the potential for vortex conditions, and the ability to transfer the pump's suction during the recirculation phase of an accident. The team also performed field walkdowns to assess the material condition of the pump and supporting equipment. Finally, corrective action documents and system health reports were reviewed to verify deficiencies were appropriately identified and resolved, and that the pump was properly maintained.

b. Findings

No findings were identified.

.2.1.12 Unit 2 Containment Instrument Air Cross-tie to Station Air (2IAC-MOV-131)

a. Inspection Scope

The team inspected the Unit 2 containment instrument air to station air cross-tie MOV to verify it could meet the design function. The team reviewed the UFSAR, design basis documents, vendor manual, and procedures to identify the design basis requirements for the valve. The team performed a review of system operating procedures to assess whether component operation and alignments were consistent with design and licensing bases assumptions. The team performed a review of the abnormal and emergency operating procedures to ensure modifications to the valve were appropriately addressed in the procedures. The team interviewed the MOV program and design engineer to gain an understanding of maintenance issues and overall reliability of the valve. Additionally, the team performed field walkdowns to assess the material condition and environmental conditions associated with the valve. Finally, corrective action documents and system health reports were reviewed to verify deficiencies were appropriately identified and resolved, and that the motor-operated valve was properly maintained.

b. Findings

No findings were identified.

.2.1.13 Unit 2 480 Vac Circuit Breaker (US-2-8-3B)

a. Inspection Scope

The team inspected the 480 Vac circuit breaker (US-2-8-3B) to verify it was capable of meeting its design basis requirements. The team reviewed bus load flow calculations to determine whether the breaker was applied within its specified capacity rating under worst case accident loading and grid voltage conditions. The team reviewed short circuit calculations to determine whether the circuit breaker was applied within its specified ratings. The team reviewed schematic diagrams and calculations for 480V bus protective relays to ensure that equipment was adequately protected, the breaker was not subject to spurious tripping, and to determine whether proper coordination was maintained. In addition, the team performed a visual inspection of the 480V switchgear to assess material condition and the presence of hazards that could impact the operation of the equipment. Finally, the team reviewed corrective action documents and completed maintenance and testing records to determine whether there were any adverse operating trends and to verify deficiencies were appropriately identified and resolved.

b. Findings

No findings were identified.

.2.1.14 Unit 2 4160V Breaker (342D) and Unit 1 4160V Breaker (2E7) (2 samples)

a. Inspection Scope

The team inspected the 4160 Vac supply circuit breaker (342D) on Unit 2 used to electrically connect the service station transformer to the normal bus, and the 4160 Vac emergency bus supply circuit breaker (2E7) on Unit 1 used to connect the normal bus to the emergency bus to verify that they were capable of meeting their design basis requirements. The team reviewed applicable portions of the UFSAR, DBD, and drawings to identify the design basis requirements for the breakers. The team reviewed schematic diagrams and selected calculations for the electrical distribution system load flow/voltage drop, and electrical protection and coordination. The adequacy and appropriateness of design assumptions for the calculations were reviewed to verify that breaker capacity was not exceeded under design basis conditions. The switchgear's protective device settings and breaker ratings were reviewed to ensure that selective coordination was adequate for protection of connected equipment. The team also reviewed maintenance schedules, procedures, and completed work records to determine whether the breakers were being properly maintained. Finally, the team reviewed corrective action documentation to determine whether there were any adverse operating trends, and to determine if breakers deficiencies were being identified and corrected.

b. Findings

No findings were identified.

.2.2 Review of Industry Operating Experience (3 samples)

.2.2.1 NRC Information Notice (IN) 2005-30, Safe Shutdown Potentially Challenged by Unanalyzed Internal Flooding Events and Inadequate Design

a. Inspection Scope

The team reviewed FENOC's response to NRC IN 2005-30, "Safe Shutdown Potentially Challenged by Unanalyzed Internal Flooding Events and Inadequate Design." The team selected the EDG rooms, turbine building basement, auxiliary building, and SW intake structure pump rooms to determine if the deficiencies identified in the IN for internal flood protection measures had been evaluated by FENOC. The team walked down the areas to assess operational readiness of various features in place to protect redundant safety-related components and vital electric power systems from flooding. The team evaluated the material condition of these features including equipment drains, door seals, backflow check valves, flood detection and alarms, flood barriers, system alignments, and wall penetration seals to determine if they would be capable of fulfilling their design function.

The team also reviewed engineering evaluations, calculations, alarm response procedures, preventive and corrective maintenance history, operator training, and correct action condition reports associated with flood protection equipment and measures. Finally, the team interviewed operators to assess their knowledge of indications, procedures, and required actions associated with several postulated internal flood scenarios.

b. Findings

No findings were identified.

.2.2.2 NRC Bulletin 88-04, Potential Safety-Related Pump Loss

a. Inspection Scope

The team reviewed FENOC's response to NRC Bulletin 88-04, "Potential Safety-Related Pump Loss," with respect to the auxiliary feedwater (AFW) pumps. The team assessed FENOC's evaluation of the two main concerns discussed in the bulletin. The first concern regarding the potential for dead-heading of one or more pumps in safety-related systems that have a minimum flow line common to two or more pumps, or other piping configurations that do not preclude pump-to-pump interaction during minimum flow operation. The second concern was whether or not the installed minimum flow capacity was adequate for a single operating pump.

The team determined that FENOC assessed the impact of both issues discussed in the bulletin with respect to the three pumps in the AFW system, including the actual minimum flow rate of each pump and an assessment of strong pump/weak pump interaction. Furthermore, the team noted that FENOC received the manufacturer's limits for minimum flow and verified the adequacy of the design of the minimum flow path. The team found that the minimum flow lines of AFW were not open at all times, rather, they opened after a short duration following pump start, and then closed following the establishment of sufficient flow as measured in the pump suction piping. Therefore, the team reviewed the valves logic to ascertain that they can reopen in case a minimum flow condition occurs after closure of the valves.

b. Findings

No findings were identified.

.2.2.3 Unit 1 and Unit 2 Common SBO Cross-Tie Line and Breakers

a. Inspection Scope

The team selected the equipment as a follow-up to the resident inspector's review of the Fukushima events during the Temporary Instruction (TI) 2515/183 inspection. The team inspected the common station blackout cross-tie connection to verify it could respond to design basis events. The team conducted a walkdown of the associated breakers to determine the material condition and operating environment of the equipment. The team reviewed inspection, calibration, and overhaul procedures to verify that appropriate preventive maintenance was being performed. The team reviewed condition reports written during the last three years to assess the adequacy of corrective actions taken to address identified discrepancies. The team also reviewed design documents, voltage drop calculations and circuit drawings to evaluate the ability of the breakers and cable to perform the design functions.

The team also reviewed the PRA and human reliability analysis (HRA) studies to assess if critical operator action times assumed in the PRA were reasonable. The team interviewed licensed operators and auxiliary operators (AO), reviewed associated operating and alarm response procedures, and observed AOs simulate the required actions of the procedure in the field to evaluate the ability of the operators to perform the required actions. In addition, the team independently assessed FENOC's configuration control and the material condition of the emergency switchgear, and circuit breaker cubicles to determine if plant conditions would prevent the operator actions from being performed.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of problems that FENOC had identified and entered into their corrective action program. The team reviewed these issues to determine if FENOC had an appropriate threshold for identifying issues and to evaluate the effectiveness of planned and completed corrective actions. In addition, condition reports (CR) written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action system. The specific corrective action documents that were sampled and reviewed by the team are listed in the attachment.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

The inspectors presented the inspection results to Mr. Paul Harden, Site Vice President, and other members of FENOC staff at an exit meeting on June 17, 2011. The inspectors verified that none of the information in this report is proprietary.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel	
P. Harden	Site Vice President
M. Manoleras	Director, Engineering
R. Lieb	Director, Site Operations
C. Mancuso	Manager, Design Engineering
B. Tuite	Manager, Regulatory Compliance
B. Sepelak	Supervisor, Compliance
M. Ressler	Supervisor, Design Engineering-Analysis
B. Lubert	Supervisor, Design Engineering
J. Mauck	Compliance Engineer

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000334&412/2011007-03	URI	Degraded Voltage Relay Time Delay

Opened and Closed

05000334/2011007-01	NCV	Failure to Verify the Design Requirements for the Fuel Oil Transfer Pumps
05000412/2011007-02	NCV	Inadequate Calculations for Placing SSST LTC in Manual Mode
05000412/2011007-04	NCV	Offsite Power Non-Conservative Post Transient Voltage Calculations

LIST OF DOCUMENTS REVIEWED

Calculations

10080-DEC-0212, Beaver Valley Unit 2 480Volt Emergency Bus Undervoltage - Degraded Voltage, Rev. 0
10080-DMC-0053, High Head Safety Injection NPSH during Recirculation, Rev. 2
10080-DMC-0790, MSIV Actuator Capability Analysis, Rev. 3
10080-DMC-56, SBO - Steady State Temperature Calculation, Rev. 0
10080-E-0307, Unit 2 Electrical Protective Device Settings Calculations for 480Volt Emergency Bus 2N, Rev. 0

10080-E-0309, 4160V Emergency Bus 2AE-Brkr E11 Feeder to Emergency Substation 2-8, 1500/2000 kVA Transformer 2-8N, Rev. 0
10080-E271, BVPS Unit-2 Transient Stability Analysis, Rev. 2
10080-N-789, High Head Safety Injection Pump $NPSH_A$ from the RWST, Rev. 1
10080-N-794, Minimum Safeguards Safety Injection System Performance for the Full Potential (2900 MWt) Power Level & Containment Conversion, Rev. 1
10080-N-798, Maximum Safety Injection and Other Steam Generator Tube Rupture Analysis Design Inputs, Rev. 0
10080-N-866, Evaluation of the EDG Air Start System, Rev. 0
10080-US(B)-229, BV2 ESGR Area Heatup Following Recovery of Loss of all HVAC, Rev. 0
11700-RV-53A, Emergency Generator Fuel Oil Storage Tanks, dated 4/13/70
12241-NP(B)-X109A, Pressurizer Safety and Relief Valve Piping, Rev. 5
8700-DEC-0117, Voltage Drop Analysis of Station Blackout 4160V Cross Tie Circuit, Rev. 0
8700-DEC-0181, Setpoint Inaccuracy Calculation for Emergency Bus Degraded Grid Relays ABB-27N, Rev. 2
8700-DMC-1649, Beaver Valley Unit 1 Replacement Sump Strainer Void Fraction, Rev. 1
8700-DMC-2230, AFW Minimum Recirculation Flow Rates, Rev. 2
8700-DMC-2282, ECCS Performance, Recirculation Mode, Rev. 0
8700-DMC-2762, Torque Calculation for MOV-RH-605, Rev. 7
8700-DMC-2772, Torque Calculations for MOV-1SI-890A, Rev. 7
8700-DMC-2785, Determination of Maximum Differential Pressure Across the QA Category I MOV's in the BVPS-1 Residual Heat Removal System (RH), Rev. 1 and Rev. 1a1
8700-DMC-2812, Maximum Torque Outputs Accounting for Degraded Voltage for Selected RH Motor-Operated Valves, Rev. 6
8700-DMC-2867, Valve Weak Link Torque Based on ASME Allowable Stresses for MOV-RH-605 and MOV-RH-758, Rev. 0 and Rev. 0a1
8700-DMC-3425, Evaluation of Fuel Oil System, Rev. 0
8700-DMC-3442, BVPS Intake Structure Cubicles Internal Flood Analysis, Rev. 2
8700-DSC-6536, Capacity of Existing D.G. Floor Drainage System, Rev. 0
8700-E-048, EDG Loading Analysis at Frequency Above 60 Hz, Rev. 4
8700-E-068, Station Service Load Flow and Voltage Profile Analysis, Rev. 4
8700-E-113, MCC Control Circuit Evaluation for Class-1E MCC's, Rev. 0
8700-E-221, 4160 and 480 Volt AC Load Management and Voltage Profile Calculations Relating to Bus 1AE, Rev. 1
8700-E-271, Station Service System Dynamic Stability Study, Rev. 3
8700-N-0193, Evaluation of the Unit 1 EDG Start System, Rev. 0
8700-SP-1FW-05, Instrument Uncertainties and Setpoints for AFW Pumps Minimum Recirculation Flow Rates, Rev. 1
8700-US(B)-263, LPSI Pump Performance for Full Potential Power Level, Rev. 7
B-214, Service Building Temp. Upon Partial Loss of Ventilation, Rev. 0
CN-TA-05-104, Beaver Valley 1 and 2 Spurious SI for PORV Qualification, Rev. 0
ECP 05-0280-01, Beaver Valley Unit 1 Simultaneous Hot and Cold Leg Recirculation, Rev. 0

Completed Surveillance and Modification Acceptance Testing

1OST-10.1, Residual Heat Removal Pump Performance Test, performed 10/19/10
1LCP-10-F605, Residual Heat Exchanger Bypass Flow Loop Calibration, performed 10/15/10
1OST-11.1, Safety Injection Pump Test, 1SI-P-1A, performed 5/7/11
1OST-11.14A, LHSI Full Flow Test, performed 10/20/10

1OST-7.19B, Safety Injection Relay Test (Slave Relay K640, K641 and K642), performed 10/6/10
2BVT 1.1.2, Safeguards Time Response Test, performed 4/8/11
2MSP-36.07-E, Test and Calibrate 480V Bus 2 DF Sustained UV Detector, performed 2/25/11
2MSP-36.37-E, Test and Calibrate 4160v Bus 2DF Degraded Voltage Protection Relay, performed 11/4/10
2MSP-37.02-E, Test and Calibrate 480V Bus 2P Sustained UV Detector, performed 2/25/11
2MSP-37.04-E, Test and Calibrate 480V Bus 2P Degraded Voltage Protection Relay, performed 11/4/10
2OST-30.13.B, Train B Service Water System Full Flow Test, performed 2/23/11
2OST-36.2, Emergency Diesel Generator (2EGS*EG2-2) Monthly Test, performed 4/20/11
2OST-7.11B, CHS and SIS Operability Test – Train B, performed 3/08/11
2OST-7.5, Centrifugal Charging Pump [2CHS*P21B], performed 4/04/11
3BVT 2.36.3, Unit 1&2 SBO Cross-tie Operational Test, performed 5/05/93

Corrective Action Documents

01-07857	10-72889	11-95773*	11-96373*
02-07186	10-77508	11-95904*	11-96396*
02-09485	10-77887	11-95909*	11-96404*
04-04465	10-79901	11-95910*	11-96435*
06-03480	10-83839	11-96148*	11-96445*
06-04311	10-83840	11-96153*	11-96465*
08-40292	11-91133	11-96157*	11-96484*
08-49371	11-93729	11-96222*	11-96489*
09-52057	11-93750	11-96227*	11-96490*
09-53243	11-94181	11-96228*	11-96493*
09-56528	11-94683	11-96232*	11-96495*
09-57543	11-95145*	11-96246*	11-96504*
09-61453	11-95380*	11-96255*	11-96539*
09-61679	11-95525*	11-96259*	11-96541*
09-62681	11-95530*	11-96270*	
09-67626	11-95549*	11-96281*	
10-70809	11-95709*	11-96354*	

* Identified during inspection

Drawings

10080-2806.262-920-837, Sht. 1-N, Chemical & Volume Control Auxiliary Building, dated 06/17/81
10080-2806.263-920-013, Sht. 1-S, Chemical & Volume Control Auxiliary Building, dated 12/07/81
10080-E-5DA, Elementary Diagram - 4160V Bus 2AE Supply ACB 2E7, Rev. 19
10080-E-5DB, Elementary Diagram - 4160V Emergency Diesel Generator 2-1 ACB, Rev. 20
10080-E-5DE, Sht. 1, Elementary Diag.- 4160V Stm. Gen. Aux. Pump-2FWE*P23A, Rev. 28
10080-E-5DF, Sht. 1, Elementary Diag. - 4160V RHR PP (2RHS*P21A), Rev. 23
10080-E-5DG, Sht. 1, Elementary Diagram - 4160V Primary Comp. Cool. Pump 2CCP-P21C, Rev. 18
10080-E-5DJ, Elementary Diagram - 4160V Standby SW Pump 2SWE-P21A, Rev. 14

10080-E-5DT, Elementary Diagram - 4160V 480V Emerg. Substa 2-8 Fdr, Rev. 9
10080-E-5DU, Sht. 1, Elementary Diagram - 4160V Emergency Bus 2AE Undervoltage, Rev. 19
10080-E-5DU, Sht. 2, Elementary Diagram - 4160V Emergency Bus 2AE Undervoltage, Rev. 15
10080-E-6AA, Sht. 1, Elem. Diag. 480V Containment Air Recirc Fan 2HVR*FN201A, Rev. 20
10080-E-6BA, Elementary Diagram - 480V Emer Substation 2-8 & 2-9 Supply ACB, Rev. 9
10080-E-6BB-15, Elementary Diagram - 480V Emergency Substa 2-8 Undervoltage, Rev. 14
10080-E-6BW, Sht. 1, Elementary Diagram – 480 Vac Emergency Switchgear Fans, Rev. 17
10080-E-6BW, Sht. 2, Elementary Diag - 480 Vac Emergency Switchgear Supply Fans, Rev. 15
10080-E-6BZ, Elementary Diagram - 480V Emergency Swgr Exhaust Fans, Rev. 10
10080-LSK-15-2A, Logic Diagram Main Steam Line Trip Valves, Rev. 8
10080-LSK-15-2E, Logic Diagram Main Steam Line Trip Valves, Rev. 1
10080-RE-1A, Shts. 1 and 2, Main One Line Diagram Revs. 17 and 17
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10080-RE-1E, Sht. 2, 4160V One Line Diagram, Rev. 9
10080-RE-1F, Sht. 3, 4160V One Line Diagram, Rev. 20
10080-RE-8EL, Sht. 11, Wiring Diagram 4KVS*2AE Cub 2E11, dated 3/30/79
10080-RM-0076A, Residual Heat Removal Piping Flow Drawing Unit 2, Rev. 26
10080-RM-0407-001A, Sht. 1, Chemical and Volume Control, Rev. 20
10080-RM-0407-001B, Sht. 2, Chemical and Volume Control, Rev. 11
10080-RM-0407-005, 2CHS-P21A, 21B, 21C Lube Oil System, Rev. 10
10080-RM-0410-001, Residual Heat Removal Piping Unit 2, Rev. 16
10080-RM-0421-001, Valve Operator Diagram Main Steam System, Rev. 16
10080-RM-0430-001, Service Water Supply & Distribution, Rev. 32
10080-RM-0430-001A, Standby Service Water Supply, Rev. 7
10080-RM-0430-002, Service Water Primary Cooling, Rev. 40
10080-RM-0430-003, Service Water Primary Cooling, Rev. 24
10080-RM-0434-002, Station Service & Instrument Air, Rev. 23
10080-RM-0434-003, Containment Instrument Air, Rev. 17
10080-RM-434-10, Containment Instrument Air, Rev. 1
10080-RM-44F-3, Valve Oper No. Diagram Area Ventilation System - Miscellaneous Orange and Purple Switchgear Rooms, Rev. 3
10800-TLD-44F-003-01, Test Loop Diagram Secondary Plant Buildings HVAC System Emergency Switchgear Room Supply Fan 1HVZ*FN261A Discharge Pressure, Rev. 5
11700-6.24-1197, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-1198, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-1206, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-1540, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-1546, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-1547, Sht. 2, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-2802, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-2803, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-2805, Sht. 1, Emergency Diesel Generator Fuel System, Rev. 1
11700-6.24-1521, Sht. 1-3, Emergency Diesel Generator Fuel System, Rev. 1
12241-E-5DT, 480V Substation 2-8 FDR, Rev. 9
12241-KSK-21-55, Functional Control Diagram Emergency Switchgear Rooms, Rev. 15

2006-300-001-052, RHR Return HDR Relief Valve, Rev. C
8700-6.24-2804, Shts. 1-2 and 1-3, Emergency Diesel Generator Fuel System, Revs. 1 and 1
8700-6.24-4018, Sht. 1-1, Emergency Diesel Generator Fuel System, Rev. A
8700-06.032-0008, 800 Forged Steel Horizontal Lift Check Valves, Rev. D
8700-RE-100-A, 4KV Station Service System, Rev. 1
8700-RE-1C, Equipment One Line Diagram, Rev. 28
8700-RE-21CC, Elem. Diag. Diesel Gen. No. 2 Auxiliaries, Rev. 4
8700-RM-0053A, Flow Diagram EDG Fuel and Air Systems, Rev. 32
8700-RM-0406-001, Valve Oper. No Diagram Reactor Coolant System, Rev. 23
8700-RM-0410-001, Residual Heat Removal System, Rev. 13
8700-RM-0411-001, Piping and Instrumentation Diagram SI System, Rev. 24
8700-RM-0421-001, Valve Oper. No Diagram Main Steam, Rev. 22
8700-RM-0424-002, Valve Oper. No Diagram Feedwater System, Rev. 13
8700-RM-0430-001, River Water System Unit 1, Rev. 31
8700-RM-0430-001, River Water System Unit 2, Rev. 32
8700-RM-0436-001, Valve Oper. No Diagram EDG Air Start System, Rev. 11
8700-RM-0436-003, Valve Oper. No Diagram Lube Oil System, Rev. 6
8700-RM-0436-4, Valve Oper No Diagram Water Cooling System, Rev. 5
8700-RM-0436-5, Valve Oper No Diagram Emer Diesel Gen Air Int & Exh Sys, Rev. 3
8700-RM-436-2, Emergency Diesel Generator Fuel Oil System, Rev. 9
8700-RV-53A, Emergency Generator Fuel Oil Tank, Rev. 3
D-77-101, Refueling Water Storage Tank Unit 2, Rev. 9A
DS-C-56904, Nozzle Type Relief Valve, Rev. D
DS-C-67970-13, Relief Valve, Rev. L

Licensing and Design Basis Documents

1DBD-10, Residual Heat Removal System, Rev. 9
1DBD-36B, Design Basis Document for 4.16kV Power Distribution System, Rev. 8
2DBD-07, Chemical and Volume Control System, Rev. 13
2DBD-30, Service Water System, Rev. 17
2DBD-36B, Design Basis Document for 4.16kV Power Distribution System, Rev. 8
2DBD-37B, Design Basis Document for 480V Distribution System, Rev. 6
3150-0011, Response to NRC Bulletin 88-04, dated 5/05/88
Beaver Valley Power Station, Unit No. 1, Docket No. 50-334, Response to Requests for Information on Station Service Bus Voltage, dated 10/15/1979
Docket No. 50-334, BV-91-050, Review of EDG Fuel Oil Design Basis, dated 11/25/91
Docket No. 50-334, LPL1-1/BC, Relief Request Regarding the Fourth 10-Year Inservice Testing Program, dated 9/27/07
Docket No. 50-334, Status of Outage Commitments, dated 7/23/93
LER 91-027-00, Insufficient Diesel Generator Fuel Oil Supply, dated 10/28/91
Letter Response to NRC Bulletin 83-03: Beaver Valley Power Station, Unit No. 1 Docket No. 50-334, License No. DPR-66 IE Bulletin 83-03, dated 6/07/1983
Safety Evaluation Related to Amendment No. 40 to Facility Operating License No. DPR-66, dated 3/3/81
SRP/NUREG-0800 PSB-1, Adequacy of Station Electric Distribution System Voltages, Rev. 0
Beaver Valley Units 1 and 2 UFSAR, Tech Specs, and Bases
FENOC Letter G.R. Leidch to NRC, Response to NRC Generic Letter 2006-02, dated 4/3/06

Miscellaneous

1/2-ADM-2046, Rubber Expansion Joint Inservice Inspection (ISI) Program, Rev. 0
10080-DMS-0465, Design Engineering Specification for Replacement Centrifugal Charging/Safety Injection Pump Rotating Elements, Rev. 0
10080-DMS-0465, Design Engineering Specification for Replacement Centrifugal Charging/Safety Injection Pump Rotating Elements, Rev. 2
2BVS-78, Design Specification for 2IAC-MOV131, dated 11/18/83
600542858, Engineering Evaluation Request for BV-MOV-1RH-605, dated 5/16/2009
952189, Design Specification for RHR Relief Valve, dated 9/11/1985
Beaver Valley Off-Site Power Voltage Assessment Summer 2010, 6/8/2010
BV2-TA-19, Setting Sheet for System Station Service Transformer Voltage Regulating Relay (90-1208), 10/3/96
BVS-360, Specification for Motor Control Centers for Beaver Valley Power Station, Rev. 2
Control Room Log, completed 10/23/02 to 10/24/02
DMW-D-5277, S.O. 220, Power Operated Relief Valve, Rev. 0
Engineering Personnel Continuing Training – Module 3, dated 2010
FMEA-21-55, Sht. 15, Failure Modes and Effects Analysis Emergency Switchgear Room Ventilation, Amendment 5
ND3NSM: 4598, SBO - Alternate AC Load Management, dated 6/27/90
Operations Night Orders for Placing SSST LTC in Manual, 06/09/11
SAIC-89/1159, Technical Evaluation Report Beaver Valley Power Station Unit 1 and Unit 2 Station Blackout Evaluation, dated 8/27/90
Specification for Fuel Oil Supply Pumps, Rev. 1
System Health Report, Unit 1 480 Volt Station Service System, 4th quarter 2010
System Health Report, Unit 2 480 Volt Station Service System, 4th quarter 2010
ZHEXT1, Operators Crosstie BV1 DG – General Transient, dated 9/28/07
ZHEXT1, Operators Crosstie BV2 DG – General Transient, dated 11/01/06
ZHEXT2, Operators Crosstie BV1 DG – SLOCA or SGTR, dated 11/01/06
ZHEXT2, Operators Crosstie BV2 DG – SLOCA or SGTR, dated 9/28/07
ZHEXT3, Operators Crosstie BV1 DG – MLOCA or LLOCA, dated 11/01/06
ZHEXT3, Operators Crosstie BV2 DG – MLOCA or LLOCA, dated 10/31/06
ZHEXT4, Operator Manually Aligns SBO Breakers, dated 9/28/07

Procedures

1/2-ADM-2028, Temporary Configuration Control, Rev. 12
1/2CMP-75-MCP-5E, Electrical Test Procedure for Inspection, Verification, and Calibration Testing of 480V Motor Control Center Circuit Protectors, Rev. 1
1/2OM-35.4A.A, Voltage Schedule Guidance, Rev. 6
1/2OM-53.4A.35.1, Degraded Grid, Rev. 7
1/2PMP-75-TRF-2E, 4160V/480V Step-down Transformer Inspection, Rev. 17
1/2PMP-75VS-VNT-3M, Ventilation System Damper Maintenance, Rev. 14
1/2PMP-E-36-015, ITE Med. Voltage Ckt. Breaker Inspection and Test, 5HK-250/350, Rev. 15

1/2-PMP-E-37-010, ITE Low Voltage Circuit Breaker Inspection and Test, Rev. 13
1/2-PMP-E-37-012, Cutler Hammer 480 Volt Motor Control Center Inspection, Rev. 2
1/2-PMP-M-36-001, Diesel Generator Fuel Oil Holding or Storage Tank Cleaning, Rev. 4
1/2RCP-11-PC, Calibration of Ground Fault Relays, Types ITE/ABB GR-5 and GR-200, Rev. 7
1/2RCP-1A-PC, Calibration of Auxiliary Relays, Rev. 8

1/2RCP-31-PC, Calibration of Auxiliary Relays, Rev. 10
1/2RCP-38A-PC, Calibration of ITE/ABB Single Phase Overcurrent Relays Type 50/51, Revs. 7 and 8
1/2RCP-63-PC, Calibration of ITE/ABB Single and Three Phase Overcurrent Relays Type 50D/50H, Revs. 4 and 5
1/2RCP-64-PC, Calibration of Phase Unbalance Relays, Rev. 3
1/2RCP-69A-PC, Calibration of ABB-32 Relays, Rev. 4
1/2RCP-71-PC, Calibration of General Electric Static Time-Overcurrent Relays. Type SFC-151, Rev. 3
1/2RCP-96-PC, Calibration of Westinghouse and McGraw Edison Load Tap Changer (LTC) Voltage Regulating Relays, Rev. 3
1/2RP-2.4, Refueling Procedure Installation/Removal of Reactor Cavity Water Seal Hatch Covers, Rev. 2
1CMP-11SI-P-1A-B-1M, Low Head Safety Injection Pump Overhaul, Rev. 5
1ICP-24-FIS151A, AFW Recirculation Flow Indicator Calibration, Rev. 7
1ICP-24-FIS151B, AFW Recirculation Flow Indicator Calibration, Rev. 8
1ICP-24-FIS152, AFW Recirculation Flow Indicator Calibration, Rev. 8
1MSP-24.37-I, AFW Channel Calibration, Rev. 8
1OM-10.4.A, RHR System Startup and Operation, Rev. 33
1OM-11.4.AAA, LHSI Pump 1A Seal Water Level Low, Rev. 9
1OM-24.4.AAD, Aux Feedwater Pump Recirc Loops A/B Low Flow, Rev. 5
1OM-36.1.C, Major Components, Rev. 3
1OM-36.4.AE, Transfer of EDG Fuel Oil from Holding Tank to Storage Tanks, Rev. 4
1OM-36.4.AHF, Local Fuel Transfer, Rev. 3
1OM-36.4.AI, Limited Use Change PAF-11-01353, Draining EDG Fuel Oil Day Tanks, Rev. 1
1OM-53A.1.2-D, Unit 1 AC Power Restoration from Offsite, Rev. 2
1OM-53A.1.2-F (ISS1C), Diesel Generator Auto Loading and Auxiliary Equipment, Rev. 2
1OM-53A.1.2-S (ISS1C), Monitoring AFW Pump Performance during Loss of Station Instrument Air, Rev. 3
1OM-53A.1.A-1.14, BV-1 Actions to Establish Station Blackout Cross-tie to BV-2, Rev. 2
1OM-53A.1.A-1.2-M-AE, Actions to Establish BV-2 Cross-tie to Bus 1AE during Station Blackout, Rev. 3
1OM-53A.1.A-1.5 (ISS1C), Unit 1 Local Action to Restore AC Power, Rev. 5
1OM-53A.1.ES-1.3, Transfer to Cold Leg Recirculation, Rev. 7
1OM-53A.1.ES-1.4, Transfer to Simultaneous Cold Leg and Hot Leg Recirculation, Rev. 6
1OM-53B.4.ECA-0.0 (ISS1C), Unit 1 Loss of All Emergency 4KV AC Power Background, Rev. 8
1OM-53C.4.1.10.1, Loss of Residual Heat Removal Capability, Rev. 12
1OM-53C.4.1.34.1, Loss of Instrument Air, Rev. 16
1OM-56C.4.F-8(ISS2), Supplying EDG Fuel Oil Day Tank from the Other Storage Tank, Rev. 11
1OST-36.1, Diesel Generator No. 1 Monthly Test, Rev. 52
1OST-36.1, Diesel Generator No. 2 Monthly Test, Rev. 57
1OST-36.5A, Emergency Switchgear Operation Test (Auto Transfer from Unit to System Station Service Transformer), Rev. 9
1OST-36.7, Offsite to Onsite Power Distribution System Breaker Alignment Verification, Rev. 15
1PMP-37-SS-Linestarter-2E, Linestarter Inspection, Rev. 11
1RCP-8A-PC, Unit 1 Calibration of Westinghouse/ABB Overcurrent Relays Type CO, Rev. 2
1SQS-11.1, Safety Injection System, Rev. 1
2CMP-21, MSS-AOV-101A-B-C-2M, Main Steam Isolation Valve Actuator Repair, Rev. 6

2OM-10.1.D, Instrumentation and Controls, Rev. 0
2OM-10.4.C, Residual Heat Removal System Shutdown, Rev. 36
2OM-30.4.AAC, Service Water System Trouble, Rev. 15
2OM-34.1.B, Summary Description, Rev. 2
2OM-34.1.C, Major Components, Rev. 4
2OM-34.1.D, Instrumentation and Control, Rev. 4
2OM-34.4.C, Cross-connecting the Station Air System and Instrument Air System with Other Air Systems, Rev. 0
2OM-53A.1.1-0.4, Steam Line Isolation Checklist, Rev. 0
2OM-53A.1.A-1.11, Unit 2 Manual Handpump Operation of Hydraulic Actuated Valves, Rev. 5
2OM-53A.1.A-1.13AE, Actions to Establish BV-1 Cross-tie to Bus 2AE during Station Blackout, Rev. 2
2OM-53A.1.A-1.13DF, Actions to Establish BV-1 Cross-tie to Bus 2DF during Station Blackout, Rev. 2
2OM-53A.1.A-1.15AE, Unit 2 Starting Charging/HHSI Pump on Bus 2AE during Station Blackout, Rev. 1
2OM-53A.1.A-1.5 (ISS1C), Unit 2 Local Action to Restore AC Power, Rev. 5
2OM-53A.1.A-1.8, Unit 2 Makeup to PPDWST [2FWE*TK210], Rev. 5
2OM-53A.1.E-0, Reactor Trip or SI, Rev. 8
2OM-53A.1.E-3, Steam Generator Tube Rupture, Rev. 16
2OM-53A.1.ECA-0.0 (ISS1C), Loss of All AC Power, Rev. 10
2OM-53B.4.ECA-0.0 (ISS1C), Unit 2 Loss of All Emer 4KV AC Power Background, Rev. 10
2OM-53C.4.2.30.1, Service Water/Normal Intake Structure Loss, Rev. 8
2OM-53C.4.2.34.1, Loss of Station/Containment Instrument Air, Rev. 16
2OM-7.4.A, Placing a Charging/HHSI in Standby or in Service, Rev. 25
2OST-21.7, Main Steam System Operating Surveillance Test, Main Steam Trip Valves Full Closure Test, Rev. 15
2OST-36.5A, Auto Transfer from Unit to System Station Service Transformer, Rev. 13
2OST-36.7, Offsite to Onsite Power Distribution System Breaker Alignment Verification, Rev. 11
2PMP-37EJS-BKR-2E, 480 Volt Station Service System Supply Breaker Inspection, Rev. 6
3BVT 2.36.3, Unit 1&2 SBO Cross-tie Operational Test, Rev. 0
4.36.1, Emergency Diesel Generators Pre-Operational Test, Rev. 1
BVT 1.1-4.36.1, Emergency Diesel Generator, Rev. 1
NOP-CC-2003, Engineering Changes, Rev. 15
NOP-OP-1003, Grid Reliability Protocol, Rev. 3
NORM-ER-3103, FENOC Low and Medium Voltage Switchgear and Motor Control Centers, Rev. 4

Vendor Manuals

01.016-0140, General Instructions for Series 5600 Motor Control Centers, Rev. G
02.044-0012, Fuel Oil Supply Pumps Tech Manual (Installation and Operating Instructions for the Sier Bath Hydrex II Pumps), Dresser Industries, Rev. G
2006-300-001-052, RHR Return HDR Relief Valve, Rev. C
2502.320-001-001, Charging Safety Injection Pump Operation and Maint. Manual, Rev. BH
2506.430-22A-004, Dual Plate Check Valve, Rev. B
2506.430-22A-021, Duo-Chek Check Valve Operation & Maintenance Manual, Rev. A
2506.440-078-001, Manual and Motor-Operated Ball Valves Technical Manual, Rev. L

8700-01.016-0097, Installation, Operation, and Maintenance for Valueline Control Center Mark 1, Rev. J
8700-06.048-0121, Instruction Manual for Continental Butterfly Control Valves, Rev. V

Work Orders

200066591	200257916	200348224	200400381
200090070	200272680	200348227	200400477
200090073	200279269	200370292	200401225
200090074	200306402	200375097	200401227
200094484	200306624	200375113	200401231
200094485	200309431	200375114	200401232
200135795	200309449	200382937	200411767
200176873	200309450	200383372	200413632
200204585	200318383	200383373	
200257907	200329625	200399613	

LIST OF ACRONYMS

AO	Auxiliary Operator
AFW	Auxiliary Feedwater
BVPS	Beaver Valley Power Station
CFR	Code of Federal Regulations
CR	Condition Report
DBD	Design Basis Document
DVR	Degraded Voltage Relay
EDG	Emergency Diesel Generator
FENOC	FirstEnergy Nuclear Operating Company
FOST	Fuel Oil Storage Tank
FOTP	Fuel Oil Transfer Pump
IMC	Inspection Manual Chapter
IN	Information Notice
IP	Inspection Procedure
kV	Kilo-volts
LERF	Large Early Release Frequency
LOOP	Loss-of-Offsite Power
LOCA	Loss-of-Coolant Accident
LPSI	Low Pressure Safety Injection
LTC	Load Tap Changer
MOV	Motor-Operated Valve
MSIV	Main Steam Isolation Valve
NCV	Non-cited Violation
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
PORV	Power Operated Relief Valve
PRA	Probabilistic Risk Assessment
RAW	Risk Achievement Worth
RRW	Risk Reduction Worth

SBO	Station Blackout
SDP	Significance Determination Process
SER	Safety Evaluation Report
SPAR	Standardized Plant Analysis Risk
SSST	System Service Station Transformer
SW	Service Water
TDAFW	Turbine Driven Auxiliary Feedwater
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
Vac	Volts, Alternating Current