October 4, 2002

Mr. M. Bezilla
Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Post Office Box 4
Shippingport, Pennsylvania 15077

SUBJECT: BEAVER VALLEY POWER STATION - NRC INSPECTION REPORT 50-334/02-11, 50-412/02-11

Dear Mr. Bezilla:

On August 29, 2002, the NRC completed an inspection at your Beaver Valley Power Station, Units 1 & 2. The enclosed report documents the inspection findings which were discussed on August 29, 2002, with Mr. Frederick von Ahn and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety system design and performance capability of the Unit 2 service water system and compliance with the Commission's rules and regulations. The inspection consisted of a system walkdown, examination of selected procedures, drawings, modifications, calculations, surveillance tests, and maintenance records, and interviews with site personnel.

Based on the results of this inspection, the team identified two findings of very low safety significance (Green), and both of the issues were determined to involve violations of NRC requirements. However, because of their very low safety significance and because they have been entered into your corrective action program, the NRC is treating these issues as non-cited violations, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny any of these non-cited violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Beaver Valley facility.

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Sincerely,

/RA/

Lawrence T. Doerflein, Chief
Systems Branch
Division of Reactor Safety

Docket Nos.: 50-334, 50-412
License Nos: DPR-66, NPF-73

Enclosures: Inspection Report 50-334/02-11; 50-412/02-11
Attachment 1: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.	50-334, 50-412
Licensee No.	DPR-66, NPF-73
Report No.	50-334/02-011, 50-412/02-011
Licensee:	FirstEnergy Nuclear Operating Company
Facility:	Beaver Valley Power Station, Units 1 and 2
Location:	Post Office Box 4 Shippingport, Pennsylvania 15077
Dates:	August 12 - 16 and August 26 - 29, 2002
Inspectors:	P. Kaufman, Senior Reactor Inspector, Team Leader, DRS S. Pindale, Senior Reactor Inspector, DRS M. Gray, Senior Reactor Inspector, DRS L. Scholl, Senior Reactor Inspector, DRS S. Chaudhary, Senior Reactor Inspector, DRS J. Cummins, USNRC Contractor T. O'Hara, Reactor Inspector (Trainee), DRS A. Patel, Co-Op (Observer), DRS
Approved by:	Lawrence T. Doerflein, Chief Systems Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000334/02-011 and 05000412/02-011; On 8/12-8/29/2002; Beaver Valley Power Station, Units 1 and 2; Safety System Design and Performance Capability.

This inspection was conducted by five Region I inspectors and one NRC contractor. Two findings of very low safety significance (Green) were identified, both of which were considered to be non-cited violations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using 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 3, dated July 2000.

Cornerstone: Mitigating Systems

Green: The inspectors identified a missing piping penetration flood seal between redundant Unit 2 service water valve pit compartments. The seal had been removed during an in-progress piping modification without the licensee implementing appropriate compensatory measures while Unit 2 was operating. During the time that the flood seal was removed a passive failure of service water piping in either service water valve pit would have flooded both compartments.

The issue was considered to be of very low safety significance (Green) based on a Phase 3 evaluation of the SDP because in the event of a pipe rupture, the missing service water flood seal would not have resulted in an initiating event and the recirculation spray system, which would have been lost due to the flooding of both of the compartments in the service water valve pit, would only have been needed if another initiating event occurred following the pipe rupture. In addition, the likelihood of a pipe rupture combined with an initiating event during the limited exposure period was very small. The issue was determined to be a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control. (Section 1R21.1)

Green: The inspectors identified that the Unit 2 service water system hydraulic model in calculation 10080-N-726 failed to include the service water branch flows to four recirculation spray (RS) radiation monitor sample coolers.

This design deficiency was considered to be of very low safety significance (Green) based on service water piping flow measurements obtained during previous refueling outages in lines of similar size which indicated no impedance in service water flows. Phase 1 of the SDP screened this finding to (Green) because the failure to include the service water piping branch flows into the hydraulic model calculation would not have resulted in a loss of safety function. This design deficiency was determined to be a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control. (Section 1R21.2)

Report Details

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Safety System Design and Performance Capability (IP 71111.21)

a. Inspection Scope

The Unit 2 service water system (SWS) was evaluated during this inspection. The inspectors also reviewed selected systems that interface with the SWS, such as the standby service water system. The inspectors reviewed the SWS design basis document (DBD), the Technical Specifications (TS), the Updated Final Safety Analysis Report (UFSAR), and design output documents. The design output documents reviewed included system calculations, piping and instrumentation drawings (P&ID), and one-line diagrams. This review was performed to determine whether the system and component functional requirements during normal, abnormal, and accident conditions were being met and to ensure consistency with various design documents, design specifications, and control diagrams.

The inspectors reviewed selected electrical calculations and analyses, and instrument setpoint calculations to verify that the assumptions were appropriate, that proper engineering methods and models were used and there was adequate technical basis to support the conclusions. The inspectors specifically reviewed the design capability of major components of the system including service water pumps, standby service water pumps, and motor operated valves (MOVs) required to change state. These reviews were performed to determine if the design basis was in accordance with the licensing commitments, regulatory requirements, and design output documents.

Selected mechanical calculations and analyses were reviewed to verify that the appropriate assumptions were used and that they agreed with the current system and plant configuration. The inspectors also verified that proper engineering methods were utilized and that adequate technical bases existed to support conclusions. The inspectors performed independent calculations to evaluate the adequacy of selected design calculations and verified that recent plant modifications would not adversely affect the service water system.

The inspectors reviewed normal, abnormal, and emergency procedures to verify that they were consistent with the Unit 2 service water system design and licensing basis, risk, and operating assumptions. In addition, the inspectors reviewed the SWS interfaces (instruments, controls and alarms), and the alarm response procedures available to operators to support operator decision making.

The operational readiness, configuration control, and material condition of the SWS were assessed by reviewing applicable operating procedures, component maintenance records, preventive maintenance procedures, test procedures and system health reports, and by conducting system walkdowns. The inspectors reviewed in-service test (IST) procedures and IST test results, which included the service water full flow test results, to verify that the test met the licensing bases, and the performance data met the acceptance criteria and Technical Specification requirements. The inspectors also reviewed selected in-service test data and analyses results to verify that the data was

consistent with vendor requirements. The walkdown of the SWS was performed to verify the physical installation of the system and components was consistent with design documents, calculations, assumptions, and installation specifications. During these walkdowns the inspectors examined the design, equipment and material condition, and physical line-up of major components, including pumps, valves, piping, heat exchangers, instrumentation, and breakers. The inspectors verified that the appropriate procedures and equipment were staged at locations to assist operators in performing the appropriate manual actions when required by station procedures. The inspectors also interviewed site personnel including licensed and non-licensed operators, system engineers, and maintenance personnel, regarding the operation and performance of the Unit 2 service water system.

The inspectors reviewed selected design change packages (DCP) and safety evaluations (SE) associated with the service water system to ensure that these changes did not degrade the functional capability of the system. Additionally, the inspectors performed walkdowns of selected DCPs to ensure the changes were installed per the design change package.

b. Findings

.1 Unit 2 Service Water Valve Pit Flood Protection

Introduction

During an in-progress modification the inspectors determined that FirstEnergy did not adequately maintain the service water system within its design basis of single failure criteria when a flood seal was removed during implementation of a service water piping modification in the Unit 2 service water valve pit.

This issue was considered to be of very low safety significance (Green) because in the event of a pipe rupture, the missing service water flood seal would not have resulted in an initiating event and the recirculation spray system would only be needed if another initiating event occurred. The likelihood of a SWS pipe rupture and another initiating event during the limited exposure time that the flood seal was removed was very small. This was determined to be a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to implement measures needed to assure that the design basis for controlling flooding in the Unit 2 service water valve pit compartments was correctly translated into instructions.

Description

The Unit 2 SWS was designed to meet the single failure criteria, as defined in Standard Review Plan (SRP) 3.1.1. The SWS was designed with adequate redundancy to meet the single failure criteria, either active or passive. Two redundant SWS trains were provided, with appropriate physical and electrical separation. The single failure is a random failure in addition to: the initiating event for which the system was required; any failures which were direct consequences of the initiating event; and loss of offsite electric power if a trip of either the turbine generator or Reactor Protection System were the direct consequence of the initiating event.

During a Unit 2 service water system walkdown on August 13, 2002, the inspectors observed an unsealed pipe penetration in the wall separating redundant Unit 2 service water valve pits. The valve pits are stand alone concrete enclosures described in Beaver Valley Unit 2 UFSAR, section 3.6, that each contain safety-related service water motor operated valves and piping for one train of SWS. The design is such that flooding conditions from a postulated pipe rupture in one valve pit compartment will not affect the redundant valves in the adjacent valve pit compartment.

The inspectors determined that Beaver Valley personnel were replacing degraded 6" diameter carbon steel service water supply piping to control room chiller condensers in accordance with Engineering Change Package 02-0253. The 6" diameter pipe routed through the wall separating the service water valve pits had been removed the previous day, along with the piping penetration seal which provided the flood barrier. The unsealed pipe penetration degraded the service water valve pit wall and a postulated service water pipe rupture in either of the valve pits could flood the compartments and compromise the capability of the redundant train of the service water system. The inspectors determined that the design change package was less than adequate because no evaluation was done, or compensatory actions implemented, to account for internal flooding when the flood seal was removed.

In response to the inspectors' concern, FirstEnergy entered the applicable technical specification (TS) action statement. Maintenance personnel promptly installed a temporary piping penetration seal on August 13, 2002, to restore the Unit 2 service water valve pit flood protection design, and the TS action statement was exited. Site personnel initiated CR 02-06600 to address the issue within their corrective action program.

The inspectors reviewed the functions of the motor operated valves in the valve pits to determine the potential effect if the valve pits were to flood. The inspectors determined only the recirculation spray service water supply valves were required to reposition during an accident. Failure of these valves would result in a loss of the recirculation spray system.

Analysis

This issue was a performance deficiency since the service water valve pit flood compartment design described in the UFSAR was not properly maintained for approximately 28 hours while the Unit 2 plant was in operation, or alternatively evaluated as acceptable prior to the modification work.

The missing flood seal between the redundant compartments in the Unit 2 service water valve pit was considered more than minor because it affected the design control attribute of the mitigating system cornerstone and it impacted the availability of the recirculation spray system following an internal flooding event. Phase 1 of the At-Power Reactor Safety Significance Determination Process (SDP) screened this finding to Phase 3 because the missing flood barrier, which is designed to mitigate an internal flooding event, would directly result in the loss of both trains of the recirculation spray system following an internal flooding event in either compartment of the Unit 2 service water valve pit.

Summary of Phase 3 Risk Evaluation

Both trains of the recirculation spray system would have been lost because the normally closed recirculation spray service water supply valves (2SWS-MOV103A and B) are required to reposition open to support operation of the recirculation spray system. The motor-operated valves, one of which is located in each compartment in the service water valve pit, are not designed to operate while submerged and would have electrically faulted when called upon to operate. Because a pipe rupture and flooding of both compartments of the Unit 2 service water valve pit would not directly result in an initiating event, the recirculation spray system would only have been needed if another initiating event occurred following the pipe rupture. The likelihood of a pipe rupture combined with initiating event during the limited exposure period was very small. Consequently, the issue was determined to be of very low safety significance (Green) using Phase 3 of the NRC At-Power Reactor Safety Significance Determination Process.

Enforcement

10 CFR 50 Appendix B, Criterion III, Design Control, requires, in part, that measures be established to assure that the design basis for safety-related structures, systems and components are correctly translated into specifications, drawings, procedures and instructions. Contrary to this requirement, Engineering Change Package 02-0253 did not provide instructions for maintaining flood barrier control for the Unit 2 service water valve pit compartments in accordance with the design basis of the Unit 2 service water system single failure requirements described in the UFSAR, when the Unit 2 service water piping modification was in-progress on August 12 - 13, 2002. However, because of the very low safety significance of this issue, and because it was entered into the Beaver Valley corrective action program as CR 02-06600, the issue is being treated as a non-cited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy, issued on May 1, 2000 (65 FR 25368). **(NCV 50-412/02-011-01)**

.2 Recirculation Spray Radiation Monitor Cooler Flows

Introduction

The inspectors identified that the Unit 2 service water system hydraulic model in calculation 10080-N-726 failed to include the service water branch flows to four recirculation spray (RS) radiation monitor sample coolers.

This issue was considered to be of very low safety significance (Green) based on service water system piping flow measurements obtained during previous refueling outages which indicated no impedance in service water piping flows. This design deficiency was determined to be a non-cited violation of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to implement measures to assure that the service water system hydraulic calculation 10080-N-726 models flow to all safety-related heat exchangers aligned during design basis conditions.

Description

The inspectors reviewed SW system hydraulic calculation 10080-N-726 and determined it omitted the SW branch lines that provide flow to the recirculation spray radiation monitor coolers. Calculation 10080-N-726 models service water system flow resistance based on flow and pressure data recorded during the refueling outage service water full flow test. The model is then run assuming limiting river temperature, level and service water pump performance conditions to calculate cooling flows to safety-related heat exchangers and to verify cooling flow would be adequate during limiting design conditions.

The inspectors reviewed design drawings and determined that a sample of the service water outflow from each of four RS heat exchangers was routed to the tube side of a cooler, and then to a radiation monitor. The radiation monitor was designed to detect RS heat exchanger tube leaks during postulated accident conditions. The shell side of the coolers were supplied with SW to reduce the sample temperature to that required by the radiation detector design. The inspectors compared the design drawings to the hydraulic model in calculation 10080-N-726 and determined SW flow to the four sample coolers was not included in the model. The inspectors further noted that while the radiation monitors and coolers were described in Section 11.5 of the safety analysis report, they were omitted from UFSAR, Table 9.2-2 which tabulated SW flows to safety-related heat exchangers, and they were not described in the service water design basis document. FirstEnergy personnel initiated CR 02-06601 to revise the hydraulic model and verify adequate flow through the coolers. FirstEnergy personnel also initiated CR 02-06645 to revise UFSAR, Table 9.2-2 and DBD to include the sample coolers and SW flows. In addition, the inspectors noted the BV Latent Issues Review team identified other deficiencies with the design and testing of these coolers which were documented CR 02-05781.

Analysis

This was a performance issue since the hydraulic calculation in concert with the full flow test procedure should verify adequate flow would be provided to the safety-related RS radiation monitor coolers. This issue affects the mitigating system cornerstone since adequate service water flow to these coolers was required to detect and mitigate potential RS tube leaks during postulated accident conditions. This finding was more than minor based on similar issues described in NRC Inspection Manual Chapter 0612, Appendix E, Section 3.a and 3.i. These examples indicate an issue was more than minor if design basis document revisions will be required to verify the issue was acceptable.

However, this issue was determined to be of very low safety significance (Green) based on service water system piping flow measurements obtained during previous refueling outages in lines of similar size which indicated no impedance in service water piping flows. Additionally, since the recirculation spray heat exchangers were normally maintained in a dry condition during power operation to help prevent corrosion, it was not likely the heat exchanger tubes would leak and require the operation of the radiation monitors to alert operators of this abnormal condition. Phase 1 of the At-Power Reactor Safety Significance Determination Process (SDP) screened this finding to (Green) because the design deficiency for failure to include the service water branch flows into the hydraulic model calculation would not have resulted in a loss of safety function.

Enforcement

10 CFR 50, Appendix B, Criterion III, Design Control, requires in part, that the design basis for safety-related equipment be correctly translated into specifications, drawings, procedures and instructions. Contrary to this requirement, since at least 1995, flow to the recirculation spray heat exchanger sample coolers and heat loads had not been included in Unit 2 service water hydraulic calculations used to ensure the system flow would be acceptable under limiting conditions. However, because of the very low safety significance of this issue, and because it was entered into the Beaver Valley corrective action program in CR 02-06601, the issue was treated as a non-cited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy, issued on May 1, 2000 (65 FR 25368). **(NCV 50-412/02-011-02)**

4. OTHER ACTIVITIES (OA)

4OA1 Identification and Resolution of Problems (IP 7111121)

a. Inspection Scope

The inspectors reviewed the licensee's effectiveness in identifying and resolving problems associated with the Unit 2 service water system. The inspectors reviewed condition reports, Licensee Event Reports (LERs), and work orders to assess plant performance and licensee corrective actions. In addition, the inspectors reviewed condition reports associated with the self-assessment of Unit 2 service water system which was in-progress at the time of this inspection. This review was to verify that identified issues were appropriately either entered into the corrective action program for timely resolution or resolved.

b. Findings

No findings of significance were identified.

4OA6 Exit Meeting Summary

The inspectors presented the inspection results to Mr. Frederick von Ahn and other members of FirstEnergy management at the conclusion on the inspection on August 29, 2002. Proprietary information examined during the inspection was identified and returned to the licensee at the conclusion of the inspection.

ATTACHMENT 1
SUPPLEMENTARY INFORMATION

Key Points Of Contact

FirstEnergy Nuclear Operating Company

F. von Ahn	Director, Nuclear Engineering
M. Manoleras	Acting Manager, Nuclear Engineering, Design Engineering
K. Frederick	Supervisor, Design Engineering
F. Oberlitner	Lead Nuclear Engineer, Design Engineering
J. Humphries	System Engineer, Service Water System
G. Boy	Maintenance Engineer
R. Schieb	Shift Manager, Operations
D. Jones	IST Coordinator
B. Sepelak	Supervisor, Nuclear Regulatory Compliance
J. Ankney	Lead Nuclear Engineer, Design Engineering
B. Murtaugh	Senior Nuclear Engineer, Design Engineering
M. Patel	Lead Nuclear Engineer, Design Engineering

United States Nuclear Regulatory Commission

L. Doerflein	Chief, Systems Branch, RI DRS
D. Kern	Senior Resident Inspector
G. Smith	Resident Inspector

List of Items Opened, Closed, and Discussed

Opened/Closed

50-334;412/02-11-01	NCV	Unit 2 Service Water Valve Pit Flood Protection Barrier Not Maintained During Design Modification
50-334;412/02-11-02	NCV	Recirculation Spray Radiation Monitor Cooler Flows Not Accounted For In Service Water Hydraulic Calculation

List of Documents Reviewed

Design Bases Documents

2DBD-30	Design Basis Document for Service Water System, Rev. 9
2DBD-M-003	Design Basis Document for Piping Design and Piping, Tubing, and Duct Stress Analysis, Rev.1

Procedures

NPDAP 7.12	Non-Outage Planning, Scheduling, and Risk Assessment, Rev. 11
BVT 02.30.01	2SWS*P21A Head Capacity Curve Test, completed July 24, 2001
2BVT-2.30.3	Service Water Pump [2SWS*P21C] Head Capacity Curve, Rev. 9
1OM-30.4.G	Screenwash System Startup, Issue 4, Revision 2
1OM-30.4.G	Screenwash System Running, Issue 4, Revision 0
1OM-30.4.AAN	Traveling Water Screen Differential High, Issue 3, Revision 2
1OM-30.4.AAM	Traveling Water Screen Trouble, Revision 1
2OM-30.2.B	Setpoints, Issue 4, Revision 11
2OM-30.3.B.1	Valve List - 2SWS, Rev. 25
2OM-30.4.A	Service Water System Startup, Rev. 12
2OM-30.4.B	Service Water System Running During Cold and Warm Weather Conditions, Rev. 7
2OM-30.4.C	Service Water System Shutdown, Rev. 4
2OM-30.4.G	Standby Service Water System Startup. Rev. 11
2OM-30.4.AAA	Service Water Pump Auto-Start/Auto-Stop, Rev. 3
2OM-30.4.AAB	Service Water Header Pressure Low, Rev. 2
2OM-30.4.AAC	Service Water System Trouble, Rev. 8
2OM-30.4.AAF	Standby Service Water Pump Auto-Start/Auto-Stop, Rev. 2
2OM-30.4.AAH	Local - Standby Service Water Pump A Seal Water Pressure Low, Rev. 1
2OM-30.4.AAI	Local - Standby Service Water Pump B Seal Water Pressure Low, Rev. 1
2OM-53A.1.A-0.11	Verification of Automatic Actions, Rev. 2
2OM-53A.1.ECA-0.0	Loss of All AC Power, Rev. 2
2OM-53B.4.E-0	Reactor Trip or Safety Injection Background, Rev. 3
2OST-30.1A	Standby Service Water Pump [2SWE-P21A] Test, Rev. 17
2OST-30.1B	Standby Service Water Pump [2SWE-P21B] Test, Rev. 17
2OST-30.2	Service Water Pump [2SWS*P21A] Test, Rev. 22
2OST-30.3	Service Water Pump [2SWS*P21B] Test, Rev. 23
2OST-30.4	Service Water System A Header Valve Test, Rev. 10
2OST-30.5	Service Water System B Header Valve Test, Rev. 11
2OST-30.6A	Service Water Pump [2SWS*P21C] Test on Train A Header, Rev. 5
2OST-30.6B	Service Water Pump [2SWS*P21C] Test on Train B Header, Rev. 5
2OST-30.13A	Train A Service Water System Flow Test, Rev. 13
2OST-30.17A	Service Water Pump Train A Seal Water System Operability Test, Rev. 15
2OST-30.17B	Service Water Pump Train B Seal Water System Operability Test, Rev. 15
2OST-45.9	Alternate Shutdown Panel Checks, Rev. 8, completed January 18, 2002
2OM-44A.1.B	Control Room Air Conditioning System Summary, Revision 1
2OM-44A.1.C	Control Room Air Conditioning System Major Components, Revision 0

2OM-44A.1.D	Control Room Air Conditioning System Control, Revision 3
2OST-45.10B	Emergency Shutdown Panel Checks, Rev. 13, completed October 21, 2000
2OST-47.3B	Containment Penetration and ASME Section XI Valve Test, Revision 28
RTL # A9.210R	Work Order Control, Rev.13
RTL # A9.401C	Equipment Performance Information Exchange (EPIX) System, Rev.0
RTL # A9.210R	Control and Issuance of Maintenance Procedures, Rev. 2
1 / 2-ADM-0805	Production /Generation Risk Determination, Rev. 2
1/2RCP-38B-PC	Calibration of ITE/ABB Three Phase Overcurrent Relays, Rev. 3
1/2RCP-11-PC	Calibration of ITE/ABB Ground Fault Relays, Rev. 3
2LCP-30-P113A	2SWS-P113A, Service Water System Supply Header Pressure Calibration, Rev. 3
2OST-1.11A	Safeguards Protection System Train A Blockable Test, Rev. 9

Design Change Packages

DCP-1923	Relocate SWS Supply to 2SWS-RQI100A-D
DCP-1998	Relocate 2SWS-E100A,B,C,D Coolant Discharge
DCP-2385	2SWS-1103,1104 Repeat Failures
DCP-1502	Unit 2 Modifications for Heat Exchanger Performance Monitoring
DCP-1604	2HVR-ACU207A and B Coil Replacement
DCP-1664	Remove Check Valve Internals for 2SWS-29, 216, 548, 1038, 1039,1040
DCP-1679	Deletion of Check Valve Body for 2SWS-29, 216, 548, 1038, 1039,1040
DCP-1723	Removal of 2SWS-PCV117A and PCV117B
DCP-1857	SWS Pipe Cleaning Access - Charging Pumps
DCP-1998	Relocate 2SWS-E100A, B, C, D Coolant Discharge
DCP-2144	Modification of Secondary Plant Component Cooling Water System Isolation Valves 2SWS-MOV107B&C
DCP-2182	Addition of Time Delay Relays for RSS Heat Exchange Radiation Monitors 2SWS-RQI1OOA, B, C, and D

Calculations

10080-N-726	Revision 0, Addendum 1 through 4
100800-N-743	Revision 0
10080-N-779	Revision 0, Addendum 0
10080-E-48	Emergency Diesel Generator Loading With Station Blackout, Rev. 12
10080-E-068	Station Service Voltage and Load Analysis, Rev. 4
10080-E-74	Station Service Fault Analysis, Rev. 3
100870-E-221	4160 and 480 Volt Load Management and Voltage Profile Calculations Relating to Bus 2AE, Rev. 0
100870-E-222	4160 and 480 Volt Load Management and Voltage Profile Calculations Relating to Bus 2DF, Rev. 0
100870-N-742	SWS Safety-Related Seal Water Pressure NSA/DBA Analysis, Rev. 0
10080-SWS-1-1-C	Unit 2 Service Water Seal Water Pressure Set Points 2SWS-PS105A,B,C, Rev. 1
10080-SWS-24-1-C	Instrument Uncertainties for Loops 2SWS-P113A,B,C & D, Service Water Discharge Pressure Low, Rev. 2
SP-2SWS-6	Set Point 2SWS-PS109 & 2SWS-PS110, Rev. 1

Work Orders

00-004343-000	00-012087-000	00-018947-000	01-011931-000
00-004750-000	00-012273-000	00-018948-000	01-012870-000
00-007235-000	00-018292-000	00-019527-000	01-014556-000
00-007537-000	00-018293-000	00-019528-000	01-014745-000
00-007540-000	00-018294-000	00-027010-000	01-016227-000
00-007649-000	00-018295-000	01-007225-000	01-017153-000
00-007690-000	00-018296-000	01-007226-000	01-017640-000
00-008938-000			

SW Pump (2SWS-P21B)

02-017777-000, The 2OST-30 failed due to low head ratio
02-014207-007, ** Contingency** Remove Pump Motor Base for Inspection
01-009051-000, Rebuild Pump Per Major Equipment Reliability Program
00-018289-000, Re-pack Pump 2SWS-2P1B
99-213266-000, 423722 Motor ran at Less than 75% rated Voltage

Containment Recirc. Spray Heat Exchanger (HX 2RSS-E21A)

02-012284-000, Inspection and Cleaning of Tube-side (River Water) of HX
01-005129-000, Inspection and Cleaning of Tube-side (River Water) of HX
00-000141-000, 434872 Inspection and Cleaning of Tube-side (River Water) HX
00-000141-003, 445787 Heat Exchanger 110-102 OPS PMT

Discharge-side Check Valve on SWE Pump (Valve 2SWE-220)

01-014045-000, Inspect Reach Rod Assembly and Lubricate Reach Rod Assembly
91-001752-000, 001752 Remove Valve from System, Inspect and Lubricate

Discharge-side Check Valve (2SWE-222)

01-007430-000, Preventive Maintenance

Jog Valve (Valve 2SWS-MOV103B)

02-009599-000, Performance of 2OST-30.20B resulted in excessive leakage
00-005246-000, 443055 Valve leaks-by Slightly
00-005246-001, 447125Valve 110-108 OPS PMT for MOV/Valve Repair

SW Pump Seal Water & MTR Cooling Filter (2SWS-STRM47))

01–014655-000, Rev. 0, Clean/Inspect Strainer and Change Gear Box Oil
00-007649,000, Rev. 2, 446259 Clean/Inspect Strainer and Change Gear Box Oil
00-018948-000, Rev. 1, Clean/Inspect Stainer and Change Gear Box Oil
00-018947-000, Rev. 2, Clean/Inspect Strainer and Change Gear Box Oil
99-224800-000, Rev. 1, 432046 Clean/Inspect Strainer and Change Gear Box Oil

SW Strainer Motor (2SWS-STRM47-MOTOR)

00-005982-000, Rev.1, 444068 Inspect, Test, & Lube Motor
01-004102-000, Rev. 1, Lubricate Motor Bearings

Drawings

10080-E-6GA	ELEM DIAG- 480V MCC CKT'S Service Water Pump Discharge Valves, Rev. 13
10080-E-6GF	ELEM DIAG- 480V MCC CKT'S Recirc. Spray Heat Exchanger Service Water Inlet Valves, Rev.17
10080-E-6GL	ELEM DIAG-480V MCC CKT'S Recirc. Spray Heat Exchanger Service Water Outlet Valves, Rev. 12
10080-E-6GQ	ELEM DIAG-480V MCC CKT'S Service Water Isolation Valves, Rev. 16
10080-E-6MR	ELEM DIAG-480V MCC CKT'S Seal Water Injection Strainer, Rev. 14
10080-E-6NQ	ELEM DIAG-480V MCC CKT'S Standby Service Water Pump Discharge Valves, Rev. 10
10080-RE-1F	4160V One Line Diagram, Rev. 19
10080-RE-21U	Three Line Power Diagram 4160VAC, 3PH, 60HZ, BUS 2AE, Rev. 6
10080-RE-21X	Three Line Power Diagram 4160VAC, 3PH, 60HZ, BUS 2DF, Rev. 5
12241-E-5DJ	ELEM DIAG - 4160V Standby Service Water Pump 2SWE-P21A, Rev. 10
12241-E-5DN	ELEM DIAG - 4160V Service Water Pump 2SWS*P21A, Rev. 10
12241-E-5DP	ELEM DIAG - 4160V Service Water Pump 2SWS*P21C, Rev. 12
12241-E-5EN	ELEM DIAG - 4160V Service Water Pump 2SWS*P21B, Rev. 15
10080-LSK-17-1A	Logic Diagram - Standby Service Water System, Rev. 14
10080-LSK-17-1B	Logic Diagram - Standby Service Water System, Rev. 13
10080-LSK-17-1C	Logic Diagram - Standby Service Water System, Rev. 13
10080-LSK-17-1D	Logic Diagram - Standby Service Water System, Rev. 16
10080-LSK-17-2A	Logic Diagram - Standby Service Water System, Rev. 11
10080-LSK-17-2B	Logic Diagram - Standby Service Water System, Rev. 11
OP Figure 30-1	Service Water Supply & Distribution, Rev. 21
OP Figure 30-1A	Standby Service Water Supply, Rev. 4
OP Figure 30-2	Service Water Primary Cooling, Rev. 23
OP Figure 30-3	Service Water Primary Cooling, Rev. 11
OP Figure 30-4	Service Water Secondary Cooling, Rev. 10
OP Figure 30-5	Notes & Reference Data, Rev. 13
2E-2322	Outline - 32KXH (Pump Drawing), Rev. K

Valve Oper. No. Diagrams

10080-RM-430-1, Rev. 21
10080-RM-430-1A, Rev. 21
10080-RM-430-2, Rev. 23
10080-RM-430-3, Rev. 11
10080-RM-430-4, Rev. 10
10080-RM-430-5, Rev. 13

Flow Diagrams

10080-RM-47A, Rev. 31
10080-RM-47B, Rev. 34
10080-RM-47C, Rev. 25
10080-RM-47D, Rev. 46
10080-RM-47E, Rev. 21
10080-RB-84C, Rev. 28

Vendor Technical Manuals

2501.100-224-001, Rev. C	SW Pumps-Motors Instruction Manual, Allis Chalmers Corp.
2506.620-98A-003, Rev. F	Self-Cleaning Strainers-Category-1, Installation, Operation, & Maintenance Manual
2502.540-242-006, Rev. E	Manual, Stand-by Service Water Pump, Type-I, Gould Pumps, Inc.
2502.242-007, Rev. B	Motor Instruction Manual, Westinghouse Corp.
2502.540-224-009	Installation, Operation & Maintenance Manual for SW Pumps, Byron Jackson Division

Condition Reports

00-0005	01-1869	02-00354	02-05675
00-0136	01-2846	02-00546	02-05734
00-0180	01-4049	02-00985	02-06228
00-1307	01-4292	02-01768	02-06462
00-3808	01-4246	02-02176	02-06600
01-0700	01-4904	02-02865	02-06601
01-0799	01-5239	02-04018	02-06603
01-0828	01-6955	02-04234	02-06631
01-1169	01-7542	02-04390	02-06638
01-1188	02-00037	02-05331	02-06645
01-1258	02-00193	02-05514	02-06699
01-1602	02-00285	02-05541	02-06703

System Health Reports

BVPS Unit 2, Service Water/Standby Service, System 30, 2nd Quarter 2001
BVPS Unit 2, Service Water/Standby Service, System 30, 1st Quarter 2002
System Improvement Plan, Unit 2, System 30

Miscellaneous

Technical Specifications 3/4.3.3.5; 3/4.7.4; 3/4.7.7
UFSAR Sections 7.2.1.3; 9.2
Technical Evaluation Report 12974, Revision 0
Licensing Document Change Notice UFSAR Change Request 202-024
In-service Test Data Plots of Head Ratio for (2SWS*P21A/B/C)

BV-2 Electrical Equipment Qualification Master List
Engineering Work Request EWR-00033 Flow Indication for Service Water Pump's Upper Bearing Coolers and Pump Seal Water
Equipment Reliability Review Flowchart
Memorandum ND1MDE:0169, Assessment of Operability, dated December 3, 2001
Service Water Pump Motor Overcurrent Relay Setting Sheets for 2SWS*P21A,B,C (Approved April 3, 1989; March 22, 1989; and April 3, 1989 respectively)
Engineering Evaluation for 2SWS-MOV103A
BVPS Service Water Operational Performance Inspection Self Assessment
SWEC Letter 2DLS-11210, Service Water System Concerns
SWEC Letter 2DLS-11788, Seal Water Isolation to the SWS Pumps
SWEC Letter 2DLS-13626, Notes of Concern, Zurn Industries

List of Acronyms

CR	Condition Report
DBD	Design Basis Document
DCP	Design Change Package
IST	In-Service Test
MOV	Motor Operated Valve
P&ID	Piping and Instrumentation Drawings
RS	Recirculation Spray
SDP	Significance Determination Process
SE	Safety Evaluations
SWS	Service Water System
SWE	Standby Service Water System
SWEC	Stone & Webster Engineering Corporation
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report