

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-454/87020(DRP); 50-455/87019(DRP)

Docket Nos. 50-454; 50-455

License Nos. NPF-37; NPF-66

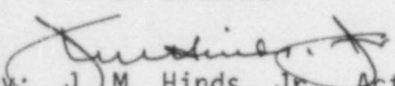
Licensee: Commonwealth Edison Company  
Post Office Box 767  
Chicago, IL 60690

Facility Name: Byron Station, Units 1 and 2

Inspection At: Byron Station, Byron, IL

Inspection Conducted: May 2 - 29, 1987

Inspectors: J. M. Hinds, Jr.  
P. G. Brochman

Approved By:  J. M. Hinds, Jr., Acting Chief  
Reactor Projects Section 1A

6.11.87  
Date

Inspection Summary

Inspection on May 2 - 29, 1987 (Reports No. 50-454/87020(DRP);  
50-455/87019(DRP))

Areas Inspected: Routine, unannounced safety inspection by the resident inspectors of licensee action on previous inspection findings; LERs; operations summary; training; containment integrity; surveillance; maintenance; operational safety and ESF walkdown; Unit 1 operating license conditions; refueling startup; event followup; and management meetings. Results: Of the nine areas inspected, no violations or deviations were identified in eight areas; one violation was identified in the remaining area; however, in accordance with 10 CFR 2, Appendix C, Section V.A, a Notice of Violation was not issued (failure to perform a fire watch patrol within an hourly time limit - Paragraph 3). This violation was of minor safety significance and did not affect the public's health and safety.

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## DETAILS

### 1. Persons Contacted

#### Commonwealth Edison Company

\$ T. Maiman, Vice President  
\$ D. Galle, General Manager, Nuclear Station Division  
\$ K. Graesser, Division Vice President, NSD  
\$\*R. Querio, Station Manager  
  #\*R. Pleniewicz, Production Superintendent  
  #\*R. Ward, Services Superintendent  
\$ W. Burkamper, Quality Assurance Superintendent  
  L. Sues, Assistant Superintendent, Operating, Byron  
\$\*G. Schwartz, Assistant Superintendent, Maintenance  
\$# T. Joyce, Assistant Superintendent, Technical Services  
  D. St.Clair, Assistant Superintendent, Work Planning  
\$ D. O'Brien, Assistant Superintendent, Operating, Braidwood  
\$ B. Shelton, Projects Engineering Manager  
  W. Blythe, Operating Engineer, Unit 0  
  J. Schrock, Operating Engineer, Unit 1  
  D. Brindle, Operating Engineer, Unit 2  
  T. Didier, Operating Engineer, Rad-Waste  
# M. Snow, Regulatory Assurance Supervisor  
#\*E. Falb, U-2 Testing Supervisor  
  \*A. Chernick, Training Supervisor  
#\*F. Hornbeak, Technical Staff Supervisor  
\$ T. Tramm, Station Nuclear Engineering  
  R. Flahive, Radiation/Chemistry Supervisor  
  P. O'Neil, Quality Control Supervisor  
  \*E. Zittle, Regulatory Assurance Staff  
  \*A. Britton, Quality Assurance Inspector  
  \*R. Klingler, Quality Assurance  
  \*W. Pirnat, Regulatory Assurance Staff  
# J. Langan, Regulatory Assurance Staff  
\$ K. Yates, Onsite Nuclear Safety, Byron Station  
\$ C. Moerke, SNED, Byron Project  
\$ D. Scott, Operations Manager

#### Sargent & Lundy

\$G. Kite, Head, EMD  
\$R. Gerke, Project Engineer,  
\$R. Hooks, Assistant Head, Structural Engineering Division  
\$W. Cleff, Project Director

#### U. S. Nuclear Regulatory Commission

\$C. Paperiello, Acting Deputy Region III Administrator  
\$N. Chrissotimos, Acting Director, DRS  
\$D. Muller, Director, Project Directorates III-2, NRR  
\$W. Forney, Chief, Reactor Projects Branch 1  
\$W. Little, Chief, Reactor Projects Branch 3

\$J. Harrison, Chief, Engineering Branch  
\$D. Danielson, Chief, Materials and Processes Section  
\$M. Ring, Chief, Reactor Projects Section 1C  
\$L. Olshan, Project Manager, NRR  
\$S. Sands, Project Engineer  
\$M. Hartzman, NRR/DEST/MEB  
\$J. Gavula, Reactor Inspector  
\$J. Hinds, Senior Resident Inspector, Byron  
\$T. Taylor, Resident Inspector, Braidwood  
\$V. Sam, Project Inspector

The inspector also contacted and interviewed other licensee and contractor personnel during the course of this inspection.

\$ Denotes those present during the management meeting on May 19, 1987.  
# Denotes those present during the management meeting on May 20, 1987.  
\* Denotes those present during the exit interview on May 29, 1987.

2. Action on Previous Inspection Findings (92701 & 92702)

- a. (Closed) Open Item (454/84049-01(DRS)): Review of SI and CV pump flow curves for evidence of decreasing margin at high flow rates. During performance of the preoperational testing of the safety injection (SI) and centrifugal charging (CV) pumps a concern was identified by Westinghouse regarding the lack of remaining margin between the SI and CV pump flow curves and the FSAR emergency core cooling system (ECCS) minimum acceptable performance curves, in a letter from W. G. Kortier to J. D. Deress, dated November 10, 1983 (CAW-6504/CBW-4392). The licensee performed pump flow testing for the SI pumps during the February - May 1987 Unit 1 refueling outage to check for degradation of pump performance. Westinghouse has determined that the ECCS pump performance curves could be relaxed, based on an increased margin which was now available, due to a new safety analysis performed to support the T-hot reduction program. The T-Hot reduction program is described in WCAP-11386 and has been reviewed and accepted by the NRC staff. The safety analysis results indicate that the calculated peak cladding temperature for all small break LOCAs was 1630.4 degrees F. These results are within the limits of 10 CFR 50.46 and are discussed in a letter from H. C. Walls to R. E. Querio, dated April 28, 1987 (CAE-87-216). Consequently, the ECCS minimum acceptable performance curves have been revised downward and the licensee has submitted a change to the FSAR to reflect the new ECCS curves. The inspector reviewed the actual pump performance curves versus the new ECCS curves to verify that the margins have increased to 115 feet and 180 feet for CV and SI pump discharge head, respectively. Based on these actions the inspector has no further concerns regarding this matter, and this item is considered closed.
- b. (Closed) Violation (454/85042-01(DRP)): Operation of the ECCS (Emergency Core Cooling System) in such a manner as to prevent the RHR (Residual Heat) system from performing its design function. This violation relates to the operation of the RHR system during surveillance testing; wherein, the SI8809 A and B valves were shut,

during pump testing, rendering the remaining pump incapable of injecting into all four reactor coolant (RC) system cold legs. The Byron FSAR required injection into all four RC cold legs by one RHR pump. A notice of violation and proposed imposition of civil penalty, letter from J. G. Keppler to J. J. O'Connor, dated May 6, 1986, documented this event. The violation was classified as a Severity Level III and a \$50,000 civil penalty was proposed, with no mitigation or escalation. The licensee provided information which requested that the violation be reclassified from Severity Level III and the \$50,000 civil penalty be fully mitigated. The NRC Staff reviewed the licensee's response and an order imposing the civil penalty was issued, letter from J. M. Taylor to J. J. O'Connor, dated February 26, 1987. In a letter from C. Reed to J. Lieberman, dated April 27, 1987, the licensee disagreed with the Staff's decision, but paid the civil penalty. The inspector reviewed the corrective actions for this violation which were detailed in the July 3, 1986 letter and verified that they had been implemented as stated. The operating and surveillance test procedures have been revised to indicate when the RH8716 and SI8809 valves can be shut and when they are required to be open by Technical Specifications. Based on the corrective actions taken this violation is considered closed.

- c. (Closed) Violation (454/86040-03(DRP)): Inadequate storage of class 1-E battery charger 1AF01EA-1. This item is related to the inadequate storage of a class 1-E battery charger. The inspector reviewed the licensee's response in Inspection Report 454/87002(DRP) and this item remained open pending completion of the installation and post-modification testing of the battery charger. The inspector reviewed the acceptance test for modification M6-1-85-060 and verified that the battery charger performed acceptably. Based on this review, the inspector has no further concerns regarding this matter, and this item is considered closed.
- d. (Closed) Violation (454/86046-02(DRP)): Failure to analyze grab samples with radiation monitor 1RE-PR002 inoperable. The inspector reviewed the licensee's response to this violation and verified that the corrective actions stated in the response had been accomplished. The inspector interviewed operating department and radiation chemistry department personnel to verify their understanding of the corrective actions to require that LCO (limiting condition for operation) paperwork be hand carried to the radiation-chemistry department for implementation of compensatory grab sampling. Based on the interviews, the inspector has no further concerns regarding this matter, and this item is considered closed.
- e. (Closed) Open Item (454/87004-01(DRS)): Review of simultaneous pump starts of auxiliary feedwater (AF) pumps 1A and 1B performed after modifications to the AF005 valves. The licensee modified the AF system to improve the controllability of the AF005 valves, in modification M6-1-86-028. As a result of this modification the licensee reperfomed portions of a preoperational test which verified the ability of the AF pumps to start and remain running following a worst case suction pressure transient. The worst case

suction pressure transient occurs when both AF pumps start simultaneously and inject into the steam generators. The inspector reviewed the test results and verified that the AF pumps continued to run after the suction pressure transient. Based on this review, the inspector has no further concerns regarding this matter, and this item is considered closed.

- f. (Closed) Violation (455/87010-01(DRP)): Operation of Unit 2 with two of the required three trains of the Non-Accessible Area Exhaust Filter Plenum inoperable. The inspector reviewed the licensee's response to this violation and verified that the corrective actions stated in the response had been accomplished. Charcoal booster fan operating procedure BOP VA-5 and station out-of-service procedure BAP 330-1 have been revised to incorporate the lessons learned from this violation. Based on the actions taken, the inspector has no further concerns regarding this matter, and this item is considered closed.
- g. (Closed) Violation (455/87010-02(DRP)): Operation of Unit 2 with both of the essential service water (SX) makeup pumps inoperable. The inspector reviewed the licensee's response to this violation and verified that the corrective actions stated in the response had been accomplished. Daily orders were issued to control room operators regarding acknowledgement of alarms. The inspector had observed that the operator's performance has been in accordance with the daily order. The licensee has completed additional training of licensed operators to ensure they understand the cause of annunciator alarms before they acknowledge them. Based on the actions taken, the inspector has no further concerns regarding this matter, and this item is considered closed.

3. Licensee Event Report (LER) Followup (92700)

(Closed) LERs (454/87007-LL; 454/87009-LL; 454/87010-LL; 455/87006-LL): Through direct observation, discussions with licensee personnel, and review of records the following LERs were reviewed to determine that the reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with Technical Specifications.

<u>LER No.</u>	<u>Title</u>
<u>Unit 1</u>	
454/87007	Technical Specification required hourly firewatch late due to personnel error in issuing personal dosimetry.
454/87009	Inadvertent safety injection signal during surveillance test due to an inadequate design.
454/87010	Both trains of control room ventilation system inoperable due to breaker on "B" train and make-up unit fan trip on "A" train.

## Unit 2

455/87006

Reactor Trip from 2/4 logic coincidence on low pressurization pressure: One channel out for surveillance while another channel spiked low due to transmitter and power supply failure.

With regard to LER 454/87007, this LER describes an event in units 1 and 2, on March 16, 1987, with unit 1 in Mode 6 and unit 2 in Mode 1 at 76% power, when a routine fire watch patrol was not made within the required time limit. Due to work still in progress on fire barriers, the licensee has implemented a program of hourly fire watches as a compensatory measure. Radiation Chemistry personnel performed a review of the path taken by the fire watch and determined that due to operation of Unit 2 that neutron dosimetry should be issued to the individuals performing the fire watch. Neutron dosimetry is not regularly issued to station personnel but is issued to an individual on an as needed basis.

At approximately 2130 on March 16, 1987, the security department contacted the radiation chemistry department to notify them that an individual would need neutron dosimetry by 2200 to perform a fire watch. Radiation chemistry agreed to this; however, they did not issue the dosimetry until 2230. Consequently, the individual started the fire watch 20 minutes late and the hourly time limit for fire watch patrol was not met.

Technical Specification 3.7.11 requires that fire rated assemblies separating safety-related fire areas or redundant equipment shall be operable at all times or else establish an hourly fire watch patrol with operable fire detectors on one side of the barrier. The failure to perform a fire watch patrol within the one hour time limit is a violation of Technical Specification 3.7.11 (454/87020-01(DRP); 455/87019-01(DRP)). However, this violation meets the tests of 10 CFR 2, Appendix C, Section V.A; consequently, no Notice of Violation will be issued, and this matter is considered closed.

#### 4. Summary of Operations

Unit 1 remained shutdown in a refueling outage from February 13, 1987 until 0104 on May 28, 1987, when the unit was taken critical. During the refueling outage the licensee reconstituted 4 fuel assemblies (8 failed fuel pins), shotpeened all steam generator hot leg u-tubes (18,290 u-tubes), completed eddy current inspections on all u-tubes and plugged 10, sludge lanced all steam generators and removed approximately 218 pounds of sludge, and completed portions of the pipe whip restraint and jet deflector removal program and the snubber reduction program, for which approximately 400 tons of steel was removed from the unit 1 containment. At approximately 0400 on May 9, 1987 a waterhammer occurred on the 1B main steam line which affected 300 feet of piping (see paragraph 12.c). The unit operated at power levels up to 1% for the rest of the report period.

Unit 2 operated at power levels up to 90% until 0644 on May 4, 1987 when a reactor trip on high power range flux level occurred (see paragraph 12.b). Following repairs the reactor was taken critical at 0255 on May 5, 1987 and the unit was synchronized to the grid at 0545 the same day.

The unit operated at power levels up to 90% for the rest of the report period.

5. Training (41400 & 41701)

The effectiveness of training programs for licensed and nonlicensed personnel were reviewed by the inspectors during the witnessing of the licensee's performance of routine surveillance, maintenance, and operational activities and during the review of the licensee's response to events which occurred during the month of May 1987. Personnel appeared to be knowledgeable of the tasks being performed, and nothing was observed which indicated any ineffectiveness of training.

No violations or deviations were identified.

6. Containment Integrity Verification (61715)

The inspector performed a verification of the integrity of the Unit 1 containment after it was established by the licensee, following the refueling outage. The inspector verified through direct observation that a random sample of 22 containment mechanical and electrical penetrations were intact and in their proper position. The inspector observed the performance of a local leak rate test on the containment personnel air lock. The inspector also walked down a system designed to mitigate the release of radioactive material from containment following a LOCA (loss of coolant accident).

During the walkdown of the 1A train of the containment spray (CS) system the inspector identified that valves 1CS018A and 1CS018B were shut instead of locked open. With these valves shut, both trains of the NaOH (sodium hydroxide) spray additive system were inoperable. NaOH is added to the water sprayed into containment after a LOCA to cause the radioactive iodine present in the containment atmosphere to go into solution. This event is discussed further in inspection report 454/87022(DRP). Additionally, valve 1CS045 was found locked open, instead of locked shut and no discrepancy record was indicated in the operating department copy of the system valve lineup. This will be followed as an unresolved item (454/87020-02(DRP)). No other discrepancies were identified during the walkdown of the CS system.

7. Monthly Surveillance Observation (61726)

Station surveillance activities of the safety-related systems and components listed below were observed/reviewed to ascertain that they were conducted in accordance with approved procedures and in conformance with Technical Specifications.

The following items were considered during this review: the limiting conditions for operation were met while affected components or systems were removed from and restored to service; approvals were obtained prior to initiating the testing; testing was accomplished in accordance with approved procedures; test instrumentation was within its calibration interval; testing was accomplished by qualified personnel; test results conformed with Technical Specifications and procedural requirements and were reviewed by personnel other than the individual directing the test; and any deficiencies identified during the testing were properly documented, reviewed, and resolved by appropriate management personnel.

The following surveillance testing activity was observed/reviewed:

Pressure Transmitter 1AF051 Monthly Test

No violations or deviations were identified.

8. Monthly Maintenance Observation (62703)

Station maintenance activities of the safety-related systems and components listed below were observed/reviewed to ascertain that they were conducted in accordance with approved procedures, regulatory guides, and industry codes or standards, and in conformance with Technical Specifications.

The following items were considered during this review: the limiting conditions for operation were met while components or systems were removed from and restored to service; approvals were obtained prior to initiating the work; activities were accomplished using approved procedures and were inspected as applicable; functional testing and/or calibrations were performed prior to returning components or systems to service; quality control records were maintained; activities were accomplished by qualified personnel; parts and materials used were properly certified; radiological controls were implemented; and fire prevention controls were implemented. Work requests were reviewed to determine the status of outstanding jobs and to assure that priority is assigned to safety-related equipment maintenance which may affect system performance.

The following maintenance activity was observed/reviewed:

Repair of Instrument Inverter 2IP05E

Following completion of maintenance on the inverter, the inspector verified that the system had been returned to service properly.

No violations or deviations were identified.

9. Operational Safety Verification and Engineered Safety Features System Walkdown (71707, 71709, 71710, & 71881)

The inspectors observed control room operation, reviewed applicable logs and conducted discussions with control room operators during the month of

May 1987. During these discussions and observations, the inspectors ascertained that the operators were alert, cognizant of plant conditions, attentive to changes in those conditions, and took prompt action when appropriate. In response to events which occurred at the Peach Bottom nuclear power station the inspectors performed unannounced inspections of the Byron control room between midnight and 4 AM on May 9 and between 10 PM May 14 and 4 AM May 15, 1987. The inspectors observed that the reactor operators and senior reactor operators in the control room were alert and attentive to their duties. No unauthorized reading material or other distractions were observed in the control room. The inspectors noted that the licensee's policy of performing the bulk of the operating department and instrument department surveillances during this time period kept the operators busy and appeared to be conducive to maintaining the operators alertness.

The inspectors verified the operability of selected emergency systems, reviewed tagout records and verified proper return to service of affected components. Tours of the auxiliary, turbine, fuel handling, and rad-waste buildings were conducted to observe plant equipment conditions, including potential fire hazards, fluid leaks, excessive vibrations, and to verify that maintenance requests had been initiated for equipment in need of maintenance.

The inspectors verified by observation and direct interviews that the physical security plan was being implemented in accordance with the station security plan. In inspection Report 454/87017(DRP); 455/87016(DRP) the inspector reviewed a security event report wherein an individual was caught attempting to bring a controlled substance inside the protected area. The results of a field test had indicated the presence of marijuana. A test by a state of Illinois approved laboratory confirmed the results of the field test and the individuals site access has been permanently revoked. The inspectors have no further concerns and this item is considered closed.

The inspectors observed plant housekeeping/cleanliness conditions and verified implementation of radiation protection controls. The inspectors also witnessed portions of the radioactive waste system controls associated with rad-waste shipments and barreling. During the month of May 1987, the inspectors walked down the accessible portions of the 2B containment spray (CS) system to verify operability. During the walkdown of the CS system the inspector observed several discrepancies. Valves 2CS075, 2CS076, 2CS077, 2CS078, 2CS079, and 2CS080 were installed in the system; however, the operating department did not have a current valve lineup (BOP CS M-2, Rev.1) which showed their position. The position of valve 2CS045 had been changed from locked closed to locked open by a modification; however, the valve lineup had not been revised to indicate the new position. The valve was listed on the abnormal valve list. The inspector will followup these concerns as an unresolved item (455/87020-02(DRP)).

Facility operations observed were verified to be in accordance with the requirements established under Technical Specifications, 10 CFR, and administrative procedures.

10. Startup from Refueling (61708 & 71711)

The inspector observed plant startup, approach to criticality, and performance of physics tests to verify that these activities were conducted in accordance with approved procedures and Technical Specifications. The inspector walked down portions of the 1A auxiliary feedwater system to verify its operability prior to operation of the unit. The inspector witnessed the approach to criticality and verified that source range nuclear instruments were operating properly, that 1/M plots were being performed, that approved procedures were being used, and that activities were conducted in accordance with Technical Specifications. The inspector witnessed portions of control rod worth measurement and moderator temperature coefficient determination tests.

No violations or deviations were identified.

11. Review of Conditions for Operating License NPF-37 (92719)

The inspector reviewed the actions taken by the licensee to meet the conditions of the Unit 1 facility operating license, NPF-37, which were required prior to startup of Unit 1 after its first refueling.

- a. (Closed) License Condition 2.C(4): Seismic qualification of the Westinghouse 7300 process protection system. The inspector reviewed a letter from K. A. Ainger to T. E. Murley, dated April 20, 1987, which documented the completion of seismic qualification of the Westinghouse 7300 process protection system circuit cards. The licensee replaced the NTC, NPC, NCH, and NTD circuit cards to demonstrate seismic qualification. Based on this correspondence this license condition is considered closed.
- b. (Closed) License Condition 2.C(7): Human factors changes to source range (SR) nuclear instrument range and volume controls. The inspector reviewed modification M6-1-84-260, which relocated the range and volume controls for the audible count rate drawer 1NR034 from main control board IPM 07J to IPM 05J. 1NR 034 provides audible indication of the count rate on SR nuclear instrument channels 1NR31 or 1NR32. The inspector observed satisfactory operation of the relocated controls by the reactor operators. Based on this review, this license condition is considered closed.
- c. (Closed) License Condition 2.C(8): Iodine/Particulate sampling system. TMI action plan item II.F.1 required that the capability to monitor radioactive iodines and particulates released out the plant ventilation stack, during normal conditions and following an accident be established. The NRC Staff identified concerns with the size of the sample lines to the WRGM (Wide Range Gas Monitor). This concern was evaluated in Safety Evaluation Report (SER), Supplement 8, Section 11.5 [NUREG-0876] and the licensee's corrective actions were deemed to be adequate. Modification M6-1-84-261 replaced the 1/4" sample line with a 3/4" sample line and also added an auxiliary pump skid with isometric flow controller and flow splitter manifold.

The inspector reviewed the modification and based on this review and the SER's review this license condition is considered closed.

- d. (Closed) License Condition 2.C(10): Seismic qualification of diesel generator (DG) local control panel. In Supplement 5 of the SER, the NRC Staff identified a concern with seismic qualification of the instrumentation and controls on the DG local control panels (IPL075 and IPL08J). The adequacy of design at Byron was established by the licensee on the basis of similarity with the DG local control panels at the LaSalle plant, for which the licensee had previously tested the local DG control panels for seismic qualification. This information was reviewed by the NRC Staff in SER Supplement 8, Section 9.5.4.1 and is considered acceptable. Based on this review this license condition is considered closed.

No violations or deviations were identified.

## 12. Onsite Followup of Events at Operating Reactors (93702)

### a. General

The inspector performed onsite followup activities for events which occurred during May 1987. This followup included reviews of operating logs, procedures, Deviation Reports, Licensee Event Reports (where available), and interviews with licensee personnel. For each event, the inspector developed a chronology, reviewed the functioning of safety systems required by plant conditions, reviewed licensee actions to verify consistency with procedures, license conditions, and the nature of the event. Additionally the inspector verified that the licensee investigation had identified root causes of equipment malfunctions and/or personnel error and had taken appropriate corrective actions prior to plant restart. Details of the events and licensee corrective actions developed through inspector followup are provided in Paragraphs b and c below.

### b. Unit 2 - Reactor Trip on High Power Range Flux Level on May 4, 1987

At 0644 on May 4, 1987, with reactor power at 89%, a reactor trip on high flux level in the power range nuclear instruments occurred. Power range nuclear instrument 2NR43 was in test, for the performance of a routine surveillance, when the inverter 2IP05E failed. This inverter provides a 120 V power supply to instrument bus 211. The loss of power to instrument bus 211 caused a power range nuclear instrument 2NR41 to trip. With 2NR41 and 2NR43 tripped, the 2 of 4 logic coincidence for a high flux level reactor trip was met. Additionally, the 2A auxiliary feedwater (AF) pump did not automatically start on the steam generator LO-LO level which occurred after the reactor trip. Steam generator LO-LO level trip signals are routinely received after a unit trips from a high power level due to the "shrinkage" phenomenon. Consequently, the AF pumps start after all unit trips from a high power level. The 2B AF pump did start automatically and the reactor operators started the 2A pump manually, in accordance with emergency procedures.

When the inverter was inspected, only the AC input breaker was found to be tripped. The DC input and AC output breakers were still closed; however, the inverter did not pickup on its DC source of power. The licensee discovered that a SCR (silicon controlled rectifier) in the output gating circuit had shorted out; thereby, preventing both the AC and DC sources of power from creating the inverter's AC output. The 211 bus also powers the "A" train output slave relays for the ESF actuation system. Consequently, no power was available to cause the auto-start of the 2A AF pump; however, the pump was capable of being started manually, which it was.

The failed SCR and a damaged capacitor were replaced and inverter 2IP05E was placed back in service. The reactor was taken critical at 0255 on May 5, 1987 and the unit was synchronized to the grid at 0545 the same day. The inspectors will review this event in a subsequent report after the LER is issued.

c. Unit 1 - Significant Waterhammer in 1B Main Steam Line on May 9, 1987

Between 0400 and 0600 on May 9, 1987 a significant waterhammer occurred in the 1B main steam (MS) line downstream of the MSIV (main steam isolation valve) in non-safety related piping. Approximately 300' of 32-3/4 inch pipe was affected, resulting in a maximum deflection of 20 inches in the middle of a 200' run of piping.

At approximately 0230 on May 9, the piping was observed to be undamaged. All four MSIVs were shut and steam generator pressure was approximately 90 psig (340 degrees F primary temperature). At approximately 0400 licensee personnel began a cooldown by bypassing steam around the shut MSIVs. At 0555 an engineer touring the area for unrelated reasons observed that the 1B MS line was damaged and contacted the control room. A supervisor was dispatched to the scene and the MSIV bypass valves were shut.

The licensee immediately began an investigation of this event. Nine pipe supports and six snubbers were damaged. The pipe was vertically supported by pipe hangers consisting of a 1.5 inch steel rod which is attached to an imbedment plate in the ceiling of the steam tunnel. One of the imbedment plates for the nine supports was pulled completely out of the ceiling, and one was partially loosened. In the other supports the welds on the embedment plates had ductile failure. After inspecting the pipe and the damaged supports, the licensee jacked the pipe back up to its original location and conducted various nondestructive examinations on over 30 welds (magnetic particle, ultrasonic, and radiographic tests). No damaged welds were found on the MS piping. The snubbers which were damaged were replaced and other snubbers which could have been affected were functionally tested to verify their operability. The damaged pipe supports were repaired or replaced.

The architect/engineer [Sargent & Lundy (S&L)] performed an engineering analysis of the failure and determined that there were

three possible failure modes: single hanger fatigue failure, a locked snubber event, and a water hammer type event. The single hanger failure and locked snubber were eliminated as possible failure modes due to the inability to demonstrate the generation of forces sufficient to cause the damage which actually occurred. Due to the slope of the piping, S&L postulated that approximately 94 cubic feet (703 gallons) had accumulated in the piping immediately downstream of the MSIV when the event occurred. When the steam passed over this water it produced two effects: 1) it caused bending in the MS piping due to uneven heating conditions, and 2) caused the formation of waves in this water (free surface affect). If a wave got big enough to close off the pipe, then a slug of water would be accelerated by the steam pressure behind it. Based on the observed damage the licensee believes that the damage was caused by a combination of these two forces. The root cause of this event was the collection of water in the upward sloping pipe. To drain any water out of this pipe the licensee has added a valve which will allow an operator to drain the MS line to a floor drain. Additionally, changes were made to operating procedures to provide guidance to operators for warming steam lines and ensuring that all water is drained from the lines. This event is also reviewed in Inspection Report 454/87007.

No violations or deviations were identified.

13. Management Meetings (30702)

- a. On May 19, 1987, Mr C. J. Paperiello, Acting Deputy Region III Administrator and members of his staff met in the Region III office in Glen Ellyn, Illinois with the licensee management and other personnel denoted in Paragraph 1. This meeting was held to discuss NRC concerns related to the waterhammer event which occurred in unit 1 on May 9, 1987 (see paragraph 12.c) and to review the results of the licensee's investigation of this event and the corrective actions proposed.
- b. On May 20, 1987, Messrs. D. R. Muller, Director, Project Directorates III-2 and members of his staff, J. M. Hinds Jr., Acting Chief, Reactor Projects Section 1A, and the NRC resident inspector met with licensee management and supervisory personnel denoted in Paragraph 1 of this report. This meeting was held to discuss NRC concerns related to the testing of the essential service water cooling tower, fuel failures which occurred during unit 1, cycle 1, operation, and the licensee's significant event reporting program. Additional discussions were held relating to the reorganization of NRR (Nuclear Reactor Regulation) office.

14. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. Unresolved items disclosed during the inspection are discussed in Paragraphs 6 and 9.

15. Violations For Which A "Notice of Violation" Will Not Be Issued

The NRC uses the Notice of Violation as a standard method for formalizing the existence of a violation of a legally binding requirement. However, because the NRC wants to encourage and support licensee's initiatives for self-identification and correction of problems, the NRC will not generally issue a Notice of Violation for a violation that meets the tests of 10 CFR 2, Appendix C, Section V.A. These tests are: (1) the violation was identified by the licensee; (2) the violation would be categorized as Severity Level IV or V; (3) the violation was reported to the NRC, if required; (4) the violation will be corrected, including measures to prevent recurrence, within a reasonable time period; and (5) it was not a violation that could reasonably be expected to have been prevented by the licensee's corrective action for a previous violation. A violation of regulatory requirements identified during the inspection for which a Notice of Violation will not be issued is discussed in Paragraph 3.

16. Exit Interview (30703)

The inspectors met with licensee representatives denoted in Paragraph 1 at the conclusion of the inspection on May 29, 1987. The inspectors summarized the purpose and scope of the inspection and the findings. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.