

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-454/85042(DRP)

Docket No. 50-454

License No. NPF-37

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

Facility Name: Byron Station, Unit 1

Inspection At: Byron Station, Byron, IL

Inspection Conducted: August 12 through October 18, 1985

Enforcement Conference: Scheduled for November 22, 1985

Inspectors: W. L. Forney
P. G. Brochman

Approved By: *RF Warnick*
R. F. Warnick, Chief
Reactor Projects Branch 1

11/13/85
Date

Inspection Summary

Inspection on August 12 through October 18, 1985 (Report No. 50-454/85042(DRP))
Areas Inspected: Special unannounced safety inspection by a regional inspector and a resident inspector to review licensee performance in complying with the Facility License and Technical Specification requirements. An Enforcement Conference is scheduled for November 22, 1985. The inspection consisted of 69 inspector-hours onsite and at the Region III office by two NRC inspectors.
Results: This report identified three apparent violations of NRC requirements: (1) operation of the ECCS system designed to mitigate serious safety events such that it could not have performed its intended safety function and failure to follow the applicable Technical Specification Action Requirements - Paragraph 3; (2) failure of management controls necessary to assure compliance with the Technical Specifications, 3 examples - Paragraphs 4, 5, and 6; and (3) exceeding the reactor core licensed thermal power rating - Paragraph 7. These violations are considered to be of safety significance with the potential to effect the public's health and safety.

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DETAILS

1. Persons Contacted

Commonwealth Edison Company

R. Querio, Station Manager
R. Pleniewicz, Production Superintendent
T. Tulon, Operating Engineer
D. Brindle, Operating Engineer
F. Hornbeak, Technical Staff Supervisor
C. Kilbride, Technical Staff
E. Wurtz, Technical Staff

2. General

This inspection was conducted as a result of Region III management's continuing concern regarding Unit 1 unplanned reactor trips, missed Technical Specification surveillances, failure to meet Technical Specification Limiting Conditions for Operation Action Statement requirements, and the large number of Licensee Event Reports (LER) issued to date.

The inspection which began on August 12, 1985 and concluded on October 18, 1985, included reviews of the LERs and the circumstances surrounding: (1) operation of the unit in Mode 1 with both subsystems of the Emergency Core Cooling System (ECCS) inoperable; (2) operation of the unit in Mode 3 with Channel B of the Engineered Safety Features Actuation System (ESFAS) inoperable for a period of time in excess of that allowed by the Technical Specification Action Requirement; (3) operation of the Radioactive Gaseous Effluent system with concentrations of Hydrogen (H₂) and Oxygen (O₂) in excess of that allowed by Technical Specifications; (4) failure to take grab samples when Radioactive Gaseous Effluent Monitors for H₂ and O₂ were inoperable; and (5) operation of the unit at reactor core thermal power levels in excess of that allowed by the Facility Operating License.

The inspector's evaluation of these 5 events consisted of a review of the circumstances surrounding each LER and interviews with licensee personnel. For each LER the inspector developed a chronology; reviewed the functioning of safety systems required by plant conditions; reviewed licensee actions to verify consistency with the Facility Operating License, Technical Specifications, and implementing procedures; reviewed the licensee evaluation of the event; and reviewed previously identified problems of a similar nature. Details of the events are provided in Paragraphs 3 through 7 below.

3. Operating With Both ECCS Subsystems Inoperable

(Closed) LER (454/85081-LL): This LER described events on March 6 through July 24, 1985, while in Mode 1 (power operations greater than 5% power), involving inoperability of both ECCS subsystems and the failure to follow

Technical Specification Action Requirements. This event was discovered by licensee personnel following identification of a similar problem at the Callaway Nuclear Power Station by the NRC.

The low pressure injection portion of the ECCS consists of two Residual Heat Removal (RHR) pumps, two RHR Heat Exchangers, and suction and discharge flowpaths (see Attachment 1). Technical Specification 3.5.2 states, in part: "Two independent . . . ECCS subsystems shall be OPERABLE. . .," when in Modes 1, 2, or 3. The Safety Analysis, contained in the Byron FSAR, for a Large Break - Loss of Coolant Accident (LB-LOCA) assumes that each RHR pump is capable of injecting cold borated water into all four Reactor Coolant System (RC) cold legs during the "Injection Phase" of ECCS operation.

Both subsystems of the ECCS were rendered inoperable during the performance of Byron Technical Staff Surveillances 1BVS 5.2.f.3-1, "ASME Surveillance Requirements for Residual Heat Removal Pump 1RH01PA" [A Subsystem] and 1BVS 5.2.f.3-2, "ASME Surveillance Requirements for Residual Heat Removal Pump 1RH01PB" [B Subsystem] when valves 1RH8716A and 1SI8809A (see Attachment 1) were shut during the performance of the RHR pump 1A surveillance and also when valves 1RH8716B and 1SI8809B were shut during the performance of the RHR pump 1B surveillance.

Byron FSAR, Figure 6.3-2 (see Attachment 1) and its notes define the position of valves 1RH8716A, 1RH8716B, 1SI8809A and 1SI8809B as open during the injection phase of the ECCS operation. With valves 1RH8716A or 1SI8809A shut and RHR pump 1A isolated, the B subsystem would have only been capable of injecting water into a maximum of two RC cold legs (1 and 2). Conversely, with valves 1RH8716B or 1SI8809B shut and RHR pump 1B isolated, the A subsystem would have only been capable of injecting water into a maximum of two RC cold legs (3 and 4). Consequently, with this valve configuration both ECCS subsystems should have been considered inoperable.

Both ECCS subsystems were inoperable on nine separate instances during surveillance testing while in Mode 1. The dates of these events and the approximate length of time the valves were shut (both subsystems inoperable) is as follows:

<u>Date</u>	<u>Time Shut</u>
March 6, 1985	13.0 hours
March 7, 1985	13.0 hours
April 20, 1985	30.7 hours
April 23, 1985	6.3 hours
May 30, 1985	30.2 hours
May 31, 1985	5.5 hours
July 24, 1985	3.5 hours
July 24, 1985	1.9 hours
July 24, 1985	6.9 hours

With both ECCS subsystems inoperable, Technical Specification 3.0.3 required that within one hour action should have been initiated to place the unit in Hot Standby (Mode 3) within the next six hours and the unit should have been placed in Hot Shutdown (Mode 4) within the following six hours. Licensee personnel failed: (1) to initiate action within one hour on the following dates: March 6, 7, April 20, 23, May 30, 31, and July 24; (2) to place the unit in Mode 3 within the next six hours on the following dates: March, 6, 7, April 20, and May 30; (3) to place the unit in Mode 4 within the following six hours on the following dates: April 20 and May 30.

With one RHR pump isolated and the other RHR pump capable of only injecting water into a maximum of two RC Cold Legs, both ECCS subsystems were rendered inoperable and thus a system designed to mitigate serious safety events [LB-LOCA] would not have been able to perform its intended safety function. With both ECCS subsystems inoperable, the licensee failed to initiate the required actions. These failures are an apparent violation of Technical Specifications 3.5.2 and 3.0.3 (454/85042-01(DRP)).

If necessary, the licensed operators in the control room could have opened the valves, upon receipt of a Safety Injection signal, with the valves taking less than 10 seconds to open.

A previous violation of regulatory requirements in which both subsystems of ECCS were inoperable is described in Inspection Report No. 454/85002(DRP). In that report the violation concerned the isolation of both Safety Injection pump flowpaths. The licensee's permanent corrective action in response to violation (454/85002-02(DRP)) was submitted to the NRC in a letter from D. L. Farrar to J. G. Keppler on July 10, 1985, and stated: "Station personnel licensed at the Senior Reactor Operator level conducted a review of all operating procedures involving ECCS systems, even as a support system, to determine those procedures that could impact Technical Specification LCO's. As a result of this review, affected operating procedures were revised." The licensee's corrective action for this violation does not appear to have been effective in that it failed to identify that both ECCS systems would be inoperable during the performance of BVS 5.2.f.3-1 and 5.2.f.3-2.

A previously identified violation (2 examples) of regulatory requirements was described in Inspection Report No. 454/85016(DRP). Violation No. 454/85016-01(DRP) related to the failure to follow Technical Specification Action Requirements within the specified time limits. This violation concerned the failure to shut and de-energize the Pressurizer Power Operated Relief Valve (PORV) block valves when the PORVs were inoperable and the failure to place the Control Room Ventilation system in the makeup mode with an inoperable radiation monitor.

The inspector identified a concern to the licensee that LERs 454/85017 and 454/85040 documented the failure to follow Technical Specification Action requirements and LER 454/85011 documented the failure to maintain

two operable ECCS subsystems and questioned whether these LERs should have been listed on LER 454/85081 as "previous similar events" as required by 10 CFR 50.73(b)(2)(ii)(J)(5). Additionally, the inspector questioned the LER's lack of an assessment of the safety consequences and implications of the event as required by 10 CFR 50.73(b)(2)(ii)(J)(3). These concerns will be followed as an Unresolved Item (454/85042-02(DRP)).

The inspector identified to the licensee that the valve identification numbers and valve positions described in the notes attached to Byron FSAR, Figure 6.3-2, Sheet 3 were not correct for the valves labeled as numbers "22," "23," "24," "25," and "26." The licensee has committed to issuing an amendment to the FSAR to correct this problem and accomplishment of this action will be followed as an Open Item (454/85042-03(DRP)).

4. Failure to Follow Technical Specifications With ESFAS Channel B Inoperable

(Closed) LER (454/85069-LL): This LER described an event on July 14-15, 1985, while in Mode 3, involving the failure to place the unit in the applicable mode when required by Technical Specification 3.3.2, Table 3.3-3, Action Statement 21.

At 1904 on July 14, 1985, an instrument mechanic shorted out the power supply for Channel B of ESFAS causing a Reactor Trip. The channel was declared inoperable and licensee personnel erroneously began following the requirements of Table 3.3-3, Action Statement 14. Action Statement 14 required that the unit be placed in Cold Shutdown (Mode 5) within the next 30 hours. Licensee personnel failed to realize that Table 3.3-3, Action Statement 21 was applicable and was more restrictive than Action Statement 14.

Table 3.3-3, Action Statement 21 states: "With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, be in at least HOT STANDBY [Mode 3] within 6 hours and in at least HOT SHUTDOWN [Mode 4] within the following 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.2.1 provided the other channel is OPERABLE." Action Statement 21 was invoked by Technical Specification 3.3.2, Table 3.3-3, Function Units 4.b, "Steamline Isolation, Automatic Actuation Logic and Actuation Relays" and 6.b, "Auxiliary Feedwater, Isolation Automatic Actuation Logic and Actuation Relays". Each of these functional units required a minimum of two OPERABLE channels when in Mode 1, 2, and 3, or else follow Action Statement 21.

At 1910 on July 14, 1985, Channel B was placed in the test position [bypassed condition]. At 0104 on July 15, 1985, the unit should have been placed in Mode 4 due to the inoperability of the Steamline Isolation and Auxiliary Feedwater functions. At 0320 on July 15 licensee personnel discovered that Action Statement 21 was applicable and by 0512 had begun a cooldown to place the unit in Mode 4.

At 2307 on July 14, following replacement of the damaged power supply a surveillance to verify Channel B operability was performed. The Main Steam Isolation and Auxiliary Feedwater functions passed; however, several other functions failed to pass the surveillance. At 0200 on July 15 licensee personnel voided the surveillance. A voided surveillance is not an acceptable record to furnish evidence for activities affecting quality. Licensee personnel failed to recognize that the voided surveillance could not be used as evidence of the operability of the Main Steam Isolation or Auxiliary Feedwater Functions.

At 0552 on July 15, ESFAS Channel B was placed in Normal (after having been in Test for 10.7 hours) and the cooldown was terminated. At 0612 on July 15 licensee personnel questioned the operability of the Auxiliary Feedwater Function and resumed the cooldown. Mode 4 was entered at 1439 on July 15, 19.6 hours after Channel B was declared inoperable; Mode 5 was entered at 2048 on July 15. The failure to place the unit in Mode 4 within six hours and placing ESFAS Channel B in Test for greater than two hours is an apparent violation of Technical Specification 3.3.2 and an example of the failure of management controls necessary to assure compliance with the Technical Specifications (454/85042-04a(DRP)).

ESFAS Channel A remained operable throughout the course of this event and manual initiation of these ESF components could have been performed by the licensed operators in the control room, if necessary.

This event is indicative of failure of corrective actions provided in response to previously identified violations of regulatory requirements as described in Inspection Report (454/85016(DRP)), to ensure that Technical Specification Action Requirements are correctly identified and followed. (See Report Section 3)

The inspector identified a concern to the licensee that LERs 454/85017 and 454/85040 documented the failure to follow Technical Specification Action requirements and questioned whether these LERs should have been listed on LER 454/85069 as "previous similar events" as required by 10 CFR 50.73(b)(2)(ii)(J)(5). This concern will be followed as an Unresolved Item (454/85042-05(DRP)). An additional concern relating to use of voided documents to provide an acceptable record to furnish evidence of activities affecting quality will be followed as an Open Item (454/85042-06(DRP)).

5. Explosive Gas Concentrations in the Radioactive Gaseous Effluent System

(Closed) LER (454/85067-LL): This LER described events on July 6-14, 1985, while in Mode 1, involving failure to follow Technical Specifications Action Requirements for Radioactive Gaseous Effluents relating to the Hydrogen (H₂) and Oxygen (O₂) concentrations present in the Waste Gas system.

On July 6, 1985, an Equipment Attendant recorded a H_2 concentration of 5.5% and at 1140 a chemist recorded an O_2 concentration of 3.9% on Special Chemistry Data Sheet, BCP-400-T.60, Revision 0. Technical Specification 3.11.2.5, "Radioactive Effluents Explosive Gas Mixture," states: "The concentration of oxygen in the WASTE GAS HOLDUP SYSTEM shall be limited to less than or equal to 2% by volume whenever the hydrogen concentration exceeds 4% by volume." Applicability of this specification is "at all times." Technical Specification 3.11.2.5.a states: "With the concentration of oxygen in the WASTE GAS HOLDUP SYSTEM greater than 2% by volume but less than or equal to 4% by volume, reduce the oxygen concentration to the above limits within 48 hours." The OD Waste Gas Decay tank was taken out of service on July 6, 1985, and records indicate that the tank remained out of service, with concentration of O_2/H_2 greater than that allowed by Technical Specification 3.11.2.5.a, until July 11, 1985. There is no record to indicate that the licensee initiated any action to reduce the O_2 concentration at any time prior to July 11, 1985, in accordance with Byron Abnormal Operating Procedure OBOA PRI-8, " O_2/H_2 Explosive Mixture Units 0, 1, 2."

Technical Specification 3.11.2.5.b states: "With the concentration of oxygen in the WASTE GAS HOLDUP SYSTEM greater than 4% by volume, immediately suspend all additions of waste gases to the system and reduce the concentration of oxygen to less than or equal to 4% by volume then take ACTION as above." At 2120 on July 11, 1985, the O_2/H_2 concentrations of the OD tank were recorded as 10.8%/4.1% respectively and remained greater than that allowed by Technical Specification 3.11.2.5.b until 1348 on July 14, 1985.

Review of the licensee records indicate that OBOA-PRI-8 was entered, for tank OD, on July 11, 1985, to reduce the explosive mixture of O_2/H_2 . Licensee personnel attempted to reduce the O_2 concentration below the limit of Technical Specification 3.11.2.5.b by releasing the tank; however, the release was terminated when it was determined that Radiation Monitor OPRO2J, which controls the Waste Gas discharge valve position, was inoperable due to insufficient amount of vacuum above the low limit alarm setpoint. Subsequently, a temporary alteration was installed on July 12, 1985, which would allow the release to be accomplished. At 2100 on July 12, the release from the OD tank was recommenced; however, it was observed that the pressure in tank OA was also showing a decrease and the release was terminated once again. The reason the release was terminated was that Byron procedures do not allow for more than one Waste Gas Decay tank to be released at the same time. A nuclear work request was initiated to repair the OA tank manual release valve, and after repairs were completed the OD tank release was recommenced and a nitrogen purge was initiated. The release and the purge were terminated at 1348 on July 14, 1985, when the O_2/H_2 concentrations were determined to be less than the limits of Technical Specification 3.11.2.5.a.

Failure of the licensee's management systems to identify the high concentrations of O_2/H_2 on July 6, 1985, resulted in no action being taken by the licensee to reduce these concentrations below Technical

Specifications limits from July 6 until July 11, 1985. After identification by the licensee on July 11, that the O_2/H_2 concentration in the OD tank exceeded the limits of Technical Specification 3.11.2.5.b, subsequent management decisions and management systems failed to reduce the O_2/H_2 concentrations below Technical Specifications limits until July 14, 1985. The inspector's review determined that the items listed below were contributing factors to this event:

- a. Incomplete/inaccurate Rad-Chem records.
- b. Incomplete Limiting Condition for Operation Action Requirement (LCOAR) data sheets.
- c. Inadequate tracking of LCOAR conditions by management/supervision.
- d. Inadequate review and assessment by management/supervision of appropriate corrective actions to be accomplished.
- e. Failure of management/supervision to ensure that corrective actions identified were accomplished in a timely manner.
- f. An apparent attitude of management/supervision to disregard Technical Specification Action Requirements that do not provide specific primary plant operational penalties.

The failure to reduce the explosive concentrations of O_2/H_2 present in the Waste Gas system is an apparent violation of Technical Specification 3.11.2.5 and an example of the failure of management controls necessary to assure compliance with the Technical Specifications (454/85042-04b(DRP)).

6. Failure to Take Grab Samples With Inoperable Radioactive Gaseous Effluent Monitors

(Closed) LER 454/85082 described events on July 28 through August 4, 1985, while in Modes 1 - 4, relating to the failure to obtain and analyze grab samples from the Waste Gas system when two channels of Radioactive Effluent Monitoring Instrumentation were inoperable.

At 2200 on July 16, 1985, Technical Specification 3.3.3.10, Table 3.3-13, Instrument 3.a, OAT-GW8000, "Hydrogen Analyzer" was taken out of service. At 0720 on July 20, 1985, Table 3.3-13, Instrument 3.b, OAT-GW8003, "Oxygen Analyzer" was taken out of service.

Technical Specification 3.3.3.10, Table 3.3-13, Instrument 3.a required a minimum of one channel to be operable at all times, or else follow Action Statement 38. Instrument 3.b required a minimum of two channels to be operable at all times, or else follow Action Statement 38. Action Statement 38 states, in part: "With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, operation of this system may continue provided grab samples are taken and analyzed at least once per 24 hours"

With system operation continuing licensee personnel began taking and analyzing grab samples every 24 hours. This requirement was listed on a

status board in the Rad-Chem office. On July 27 this requirement was inadvertently erased from the status board by licensee personnel. As a consequence, the licensee failed to take and analyze grab samples on the following dates:

- a. While in Mode 3: July 28, 1985
- b. While in Mode 4: July 29 - 31, 1985
- c. While in Mode 2: August 1, 1985
- d. While in Mode 1: August 2 - 4, 1985.

The failure to obtain and analyze grab samples at least once every 24 hours is an apparent violation of Technical Specification 3.3.3.10 and an example of the failure of management controls necessary to assure compliance with the Technical Specifications (454/85042-04c(DRP)).

The failure to obtain samples required by Technical Specifications was previously described in Inspection Report 454/85021(DRP). The licensee's permanent corrective action in response to violation 454/85021-01b(DRP) was submitted to the NRC in a letter from D. L. Farrar to J. G. Keppler on July 19, 1985, and stated, in part: "A file organizer has been placed in the Station counting room for initiated surveillance procedures. Technicians are periodically instructed by the responsible foreman to review the file for initiated surveillances. Initiated surveillances are also tracked on the counting room shift turnover sheet" This violation is indicative of the licensee addressing the specific violation only, but not addressing the root cause of the problem. Consequently, the action taken to avoid further violations was not effective.

These three examples (Paragraphs 4, 5, and 6) of apparent violations of Technical Specifications are indicative of the failure of Management/management systems and failure of corrective actions provided in response to previously identified violations of regulatory requirements, as described in Inspection Reports No. 454/85016(DRP) and No. 454/85021(DRP) to ensure that Byron's operations are conducted in accordance with regulatory requirements.

7. Exceeding the Reactor Core Thermal Power Limit

(Closed) LER (454/85080-LL): This LER described events on August 6-7, 1985, while in Mode 1, involving exceeding the reactor core licensed thermal power rating.

Licensee personnel monitor reactor core thermal power with 4 channels of Nuclear Instruments (NI). These channels of "Power Range" NI are calibrated by the performance of a secondary heat balance. Byron Technical Specification Surveillance 1BOS 3.1.1-2, "Calorimetric Calculation Surveillance", accomplished this heat balance. This procedure compares the heat transferred into the steam generators with the heat transferred out of the steam generators by calculating the enthalpy of the water going in and out times its flow rate. Based on this heat balance the core thermal power is determined and the "Power Range" NI are adjusted so that 100% indicated power is equal to 3411 megawatts thermal (MWT).

Byron Station Facility Operating License NPF-37, License Condition 2.C(1) states, in part: "The licensee is authorized to operate the facility at reactor core power levels not in excess of 3411 megawatts thermal (100% power)"

A licensed operator performing the procedure identified that a portion of the feedwater flow rate was not being accounted for. In Byron's Westinghouse Model "D-4" Steam Generators the feedwater flow is split into two paths. One of these paths, the tempering line feedwater flow rate was not accounted for in the surveillance procedure; consequently, a nonconservative error was introduced into the surveillance and the "Power Range" NI were adjusted so that indicated power was lower than the actual reactor core power. Subsequently, licensee personnel reviewed the plant computer records and determined that this error had caused the licensed thermal power limit to be exceeded.

The NRC's policy regarding exceeding licensed power levels is that the average power level over any eight hour shift should not exceed the full steady-state licensed power level. While it is permissible to briefly exceed the full steady-state licensed power level by as much as 2% for as long as 15 minutes, in no case is it permissible for 102% power to be exceeded. Power excursions to less than 102% for periods longer than 15 minutes are permissible (i.e., 101% for 30 minutes, 100.5% for one hour, etc.) provided that the power level, averaged over an eight hour shift, does not exceed 100%.

Reactor core power (MWT) was greater than 100% power, averaged over an eight hour shift, on the following three instances:

- a. 1500 - 2259 on July 26, 1985 - 100.06%/3413 MWT
- b. 2300 - 0659 on July 27, 1985 - 100.18%/3417 MWT
- c. 0700 - 1459 on July 27, 1985 - 100.30%/3421 MWT.

Additionally, the average reactor core power equaled or exceeded 100.5% for greater than one hour on two instances:

- a. 2221 - 0013 on July 26, 1985 - 100.50%/3428 MWT
- b. 0924 - 1105 on July 27, 1985 - 100.68%/3434 MWT.

The failure to maintain reactor core power less than or equal to 3411 MWT is an apparent violation of Facility Operating License NPF-37, License Condition 2.C(1) (454/85042-06(DRP)). Additionally, the licensee failed to submit a written report of this event within the 30 day time limit requirement of Facility Operating License NPF-37, License Condition 2.F.

Both this apparent violation and the apparent violation described in Paragraph 3 are examples of licensee personnel failing to correctly prepare surveillance procedures and licensee management failing to adequately review surveillance procedures to ensure that all applicable safety analysis conditions had been satisfied.

8. Enforcement Conference Scheduled For November 22, 1985

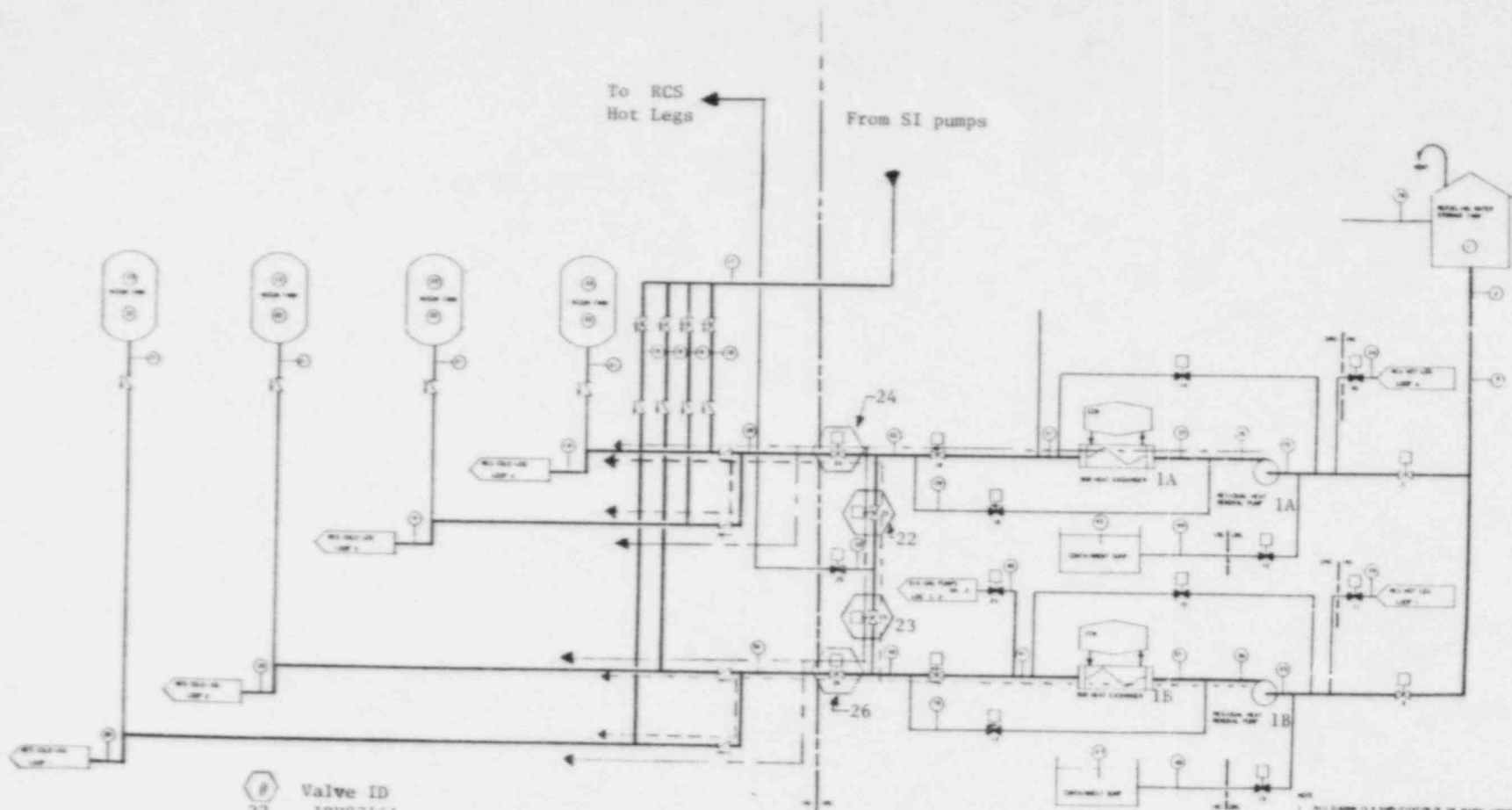
An enforcement conference is scheduled for November 22, 1985, to be held at the Region III office. The inspectors met with licensee representatives on October 28, 1985 and summarized the purpose and scope of the inspection and the apparent findings. The inspectors discussed the likely informational content 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/processes as proprietary.

9. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. Unresolved items disclosed during the inspection are discussed in Paragraphs 3 and 4.

10. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspectors, and which involve some action on the part of the NRC or licensee or both. Open items disclosed during the inspection are discussed in Paragraphs 3 and 4.



RHR Subsystem 'A' Discharge Flowpath -----
RHR Subsystem 'B' Discharge Flowpath -----

BYRON/BRAIDWOOD STATIONS
FINAL SAFETY ANALYSIS REPORT

FIGURE 6.3-2

DIAGRAM OF RESIDUAL HEAT REMOVAL

(SHEET 3 OF 3)