U.S. ATOMIC ENERGY COMMISSIO.

DIRECTORATE OF REGULATORY OPERATIONS

REGION I

RO Inspection Report No.: 50-219/73-15 Docket No.: 50-219

Licensee: Jersey Central Power and Light Company License No.: DPR-16

Madison Avenue at Punch Bowl Road Priority:

Morristown, New Jersey 07960 Category: C

Location: Oyster Creek, Forked River, New Jersey

Type of Licensee: 1930 MWe, BWR (GE)

Type of Inspection: Special, Unannounced

Dates of Inspection: September 10-12, 1973

Dates of Previous Inspection: September 5-7, 1973

Reporting Inspector: Edward A. Greenman Oct 23, 197
Edward G. Greenman, Reactor Inspector Date
Facility Operations Branch

Accompanying Inspectors: None
Date

Date

Date

Date

Date

Other Accompanying Personnel: None
Date

Reviewed by: Donald L. Caphton 10/23/7
Donald L. Caphton, Senior Reactor Inspector Date
Facility Operations Branch

Date

B/10/

SUMMARY OF FINDINGS

Enforcement Action

Violations

Technical Specification 3.7.A.2 - Failure to maintain startup transformers operable, further, Technical Specification 6.2.A.4 - a failure to provide written procedures for preventive or corrective maintenance operations (relay testing) which could have an effect on the safety of the reactor. (Report Details, Paragraph 5.b, and 9.d)

Licensee Action on Previously Identified Enforcement Items

Not inspected

Unusual Occurrences*

A. Inoperable Startup Transformers due to improper settings on the C phase differential monitoring relays - JCPL letter to Licensing dated September 18, 1973. (Abnormal Occurrence No. 73-19)

B. Failure of Isolation Condenser NE01A Condensate Return Valve V-14-34 to operate during last stages of plant cooldown - JPCL letter to Licensing dated September 18, 1973. (Abnormal Occurrence No. 73-20)

C. Failure of Hydraulic Shock and Sway Arrestors on piping systems in the Drywell - JCPL letter to Licensing dated September 21, 1973. (Abnormal Occurrence No. 73-21)

D. Failure of both Diesel Generators to restart following initiation of a fast start, receipt of a normal stop signal subsequently followed by a loss of power to the 4160V buses - JCPL letter** to Licensing dated September 18, 1973. (Abnormal Occurrence No. 73-23-1)

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* Licensee letters as referenced had not been issued at the conclusion of this inspection.

** Preliminary Report from JCPL to the Directorate of Regulatory Operations, Region I, previously designated AO-73-23.

Other Significant Findings

A. Current Findings

1. Power Failure

The power loss which occurred September 8, 1973 and resulted in a low reactor water level scram [≥ 11'5" above the top of the active fuel] was avoidable and related to the status of the licensee's Quality Assurance Program. (Report Details, Paragraphs 5 and 9.d)

2. Stack Releases

Records of maximum stack release rates reviewed for the interval just prior to and following the September 8, 1973 shutdown indicated a maximum short term peak of approximately 96,000 μCi/sec at 6:40 P.M. This release was attributed to a startup of the condenser mechanical vacuum pump. Recent stack instrumentation calibrations had been completed pursuant to Technical Specification requirements. (Report Details, Paragraph 10.a)

3. Minimum Core Coverage

Minimum coverage over the top of the active fuel during the course of the power loss situation and subsequent recovery operations was recorded at nine (9) feet. The Core Spray actuation and automatic MSIV and closure point was not reached. (Report Details, Paragraph 4.b)

4. Drywell Entry

Routine drywell entry following the plant shutdown was restricted until 1:45 A.M. September 9, 1973. Results of Occupancy Time calculation sheets for this and previous entries disclosed no apparent abnormalities. (Report Details, Paragraph 10.d)

5. Condensate Pump Failure to Start or Trip SIB During Operator Initiation

During the occurrence on September 8, 1973 one attempt to start the B and C condensate pumps failed to result in a pump start or a SIB trip. (Report Details, Paragraph 9.b)

Status of Previously Reported Unresolved Items

Not inspected

Management Interview

An exit interview was conducted on September 12, 1973 with Mr. J. T. Carroll, Station Superintendent, Mr. D. Reeves, Operations Supervisor, Mr. E. I. Riggle, Maintenance Supervisor, Mr. J. L. Sullivan, Technical Supervisor, and Mr. E. J. Growney, Engineer. Items discussed are summarized below.

A. General

The inspector summarized the scope of the special inspection pertaining to the events surrounding the loss of power situation on September 8, 1973, and the effect on reactor level, pressure and temperature, stack release indications and drywell activity.

B. Diesel Trouble (Engine Lock Out) and Inability to Restart Following a Stop Signal and Subsequent Fast Start Signal

The inspector stated that it was his understanding that a diesel trouble alarm would occur following any fast start whether the load was available or stripped, and that as a result of this problem G. M. had been contacted with respect to changes in the relay circuitry. The inspector further expressed his concern regarding potential unreviewed safety question aspects concerning the diesel situation and stated that this area should be examined, by the licensee.

A licensee representative concurred with the inspector's remarks. (Report Details, Paragraph 9.c)

C. Review of Events Precipitating the Loss of Power

The inspector stated his position that a review of the shut down on September 8 as related to the C phase differential monitoring relays, which precluded an orderly transfer of house loads was considered to be a matter of concern, and that this occurrence was considered avoidable. The inspector stated that his review indicated there was a relationship to the event and the status of the licensee's Quality Assurance program.

D. The inspector identified the following apparent violation, in addition to the violation of Technical Specification 3.7.A.2

as reported by the licensee, and represented a contributing cause - Failure to perform relay testing operations using a written procedure as required by Technical Specification 6.2.A.4.

The inspector asked if there was any question with regard to safety related aspects of this area.

A licensee representative concurred and noted the plant responsibility for this area.

DETAILS

1. Persons Contacted

Mr. I. R. Finfrock, Vice President of Power Generation
Mr. D. A. Ross, Manager, Nuclear Generating Stations
Mr. J. T. Carroll, Station Superintendent
Mr. D. Reeves, Operations Supervisor
Mr. E. I. Riggle, Maintenance Supervisor
Mr. J. L. Sullivan, Jr., Technical Supervisor
Mr. E. J. Growney, Engineer
Mr. J. Weighell, Area Field Supervisor, Allenhurst Relay Department
Mr. G. Deibert, Jr., System Protection Engineer

2. Reactor Operations

The reactor was shutdown September 8, 1973 for an inspection of hydraulic shock suppressors and routine maintenance and testing items. During the course of the referenced shutdown a reactor scram occurred from reactor low water level. (This trip occurs with water level at 11'5" above the top of the active fuel) and resulted from inoperable start up transformers and the attendant loss of circulating water pumps, recirculation pumps and the operating condensate and feedwater pumps. This scram was followed by an operator manual scram as required by procedure. Records indicated reactor pressure was maintained between about 970 - 1027.5 psig, and, an orderly cooldown initiated, utilizing both isolation condensers. Reactor cooldown rates were not exceeded.

3. Logs and Records

The following logs and records were reviewed without comment except as noted within this report.

a. Station Log Book - September 8-10, 1973
b. Shift Foreman's Log Book - September 8-10, 1973
c. Stack Gas Monitor Calibrations - April 12 and July 12, 1973
d. Stack Gas Monitor Daily Check - September 8, 1973
e. Low Reactor Water Level Sensor Calibrations - April 26 and July 16, 1973
f. Differential Relay Test Record - July 30, 1973
g. Relay Maintenance Interval Memorandum November 17, 1971
h. Occupancy Time Calculation Sheets April 13, July 20-21, September 8-9, 1973
i. Feedwater Flow and Reactor Water Level Records September 8-9, 1973

4. Primary System

a. Reactor Water Level Sensor Calibrations

Calibration records indicated sensors were calibrated April 26 and July 16, 1973 and within the frequency requirements of the Technical Specifications (Table 4.1.1-3). The as left calibrated scram setting was 51 inches, which on Yarway instrumentation corresponds to 11'5" (0 = 7'2" above the top of active fuel). This is the trip setting specified in Technical Specification 2.3.9.

b. Minimum Reactor Water Level

The inspector reviewed reactor water level and feedwater flow recorder charts for the period September 8-9, 1973. The permanent plant record indicated minimum level of coverage above the top of the active fuel was measured at 1'6" on a 0-8' scale. The inspector verified that the 0" reference point on this scale is 7'6" which corresponds to a 9' minimum water level (7'6" plus 1'6") above the fuel. The scram point on this scale is set at = 3'11", which is 11.5 feet above the active fuel. The inspector correlated readings between various level instrumentation which indicated reasonable accuracy. During ensuing discussions with licensee representatives the inspector was advised of operator indications and reports that Yarway instrumentation could have reached an indicated level of 15"-16". This indicated level on this instrumentation corresponds to a minimum level of about 8-1/2', and is a visual indication. The point at which MSIV closure and core spray actuation occurs is 7'2". Review of events recorder traces indicated that this low low water level limit was not reached during the incident. (0" on the Yarway and < 0 on the water level charts) The inspector was informed that MSIV closure was manually initiated. A licensee management representative noted he had verified MSIV closure. Events recorder indications showed only two valve closures. The events recorder did not indicate Core Spray actuation.

c. Reactor Pressure

The inspector reviewed plant records of reactor pressure for September 8, 1973. Records indicated that pressure was maintained between 970 and 1027.5 psig following the occurrence. Cooldown was initiated utilizing both isolation condensers.

d. Reactor Temperature

The inspector reviewed plant records concerning reactor temperature for the period September 8, 1973. The recorded

temperature prior to scram was 534°F, and peaked at 554°F immediately following the scram. Records indicated the subsequent cooldown was conducted within the limits specified in the Technical Specifications. (Reference 3.3.C.1)

5. Electrical Systems

Differential Monitoring Relays

a. Test Records

The inspector reviewed the Relay Department Test Record dated July 30, 1973. This record (Form 812, Revision 1 dated March 18, 1966) consisted of a single card and pertinent test data. The inspector noted that the test sheet did not specify a return of the current transformer ratio matching taps for the C phase differential relays to the "as was" condition following a test. The inspector was informed that a trip test was not performed by the relay department on July 30, 1973, and was not rescheduled by the plant. Based on the date referenced when relay work was performed for this test no redundancy for station power had been available since July 30, 1973, and apparently any attempt to transfer house loads during the interval July 30-September 8 would have resulted in a similar occurrence.

b. Test Procedure

The inspector reviewed a manufacturer's instruction No. GEA 2057A on a sampling audit basis. A licensee representative stated that this instruction constituted the only procedure utilized for relay testing requirements. The inspector's review indicated that no documentation was available for review to demonstrate that the manufacturer's instruction as specified had been followed, nor provided assurance that any test prerequisites had been met. The inspector further noted that the licensee's surveillance frequency did not follow the specified interval in GEA 2057A and that an adequate procedure was not used or available. (Violation, Technical Specification 6.6.2.A - reference Paragraph 9.d)

c. Inspection of Relay Department Work

The inspector asked cognizant licensee representatives who was responsible for inspecting relay testing activities. A licensee representative stated that no documentation was available to verify any inspection other than by two licensee personnel from the Allenhurst Relay Department performing the work. The inspector's review of relay records indicated a notation had been made

that a trip test was still required in this instance. The inspector was informed by a licensee representative that such a review had not been conducted.

d. Incorporation of Requirements and Acceptance Criteria in Procedures

The inspector's review of relay test records and instructions indicated no single document which incorporated design requirements and acceptance limits. Further, the records reviewed failed to specify returning the test tap to its original position. An adequate procedure was not used or available. (Violation, Technical Specification 6.2.A.4)

e. Test Instrumentation (Relay Testing)

The inspector's review of the instruction used as a procedure did not show that test instrumentation used was clearly spelled out and did not specify calibration requirements. The inspector was advised by a licensee representative that test equipment is the responsibility of the field supervisor and is not referenced by any procedure. An adequate procedure was not used or available. (Violation, Technical Specification 6.2.A.4)

f. Planned and Periodic Audits (Relay Department)

Audit System

The inspector was informed by a licensee representative that the only audits conducted are informal and completed by relay department supervision. Additionally a safety audit of departmental activities is also conducted. A licensee representative stated that planned and periodic audits are not conducted by personnel from outside the department.

6. Containment Systems

A review of containment systems action indicated that the systems appeared to have responded upon demand during the time interval concerning the loss of power incident. MSIV closure was manually initiated.

7. Emergency Core Cooling Systems

Isolation Condenser Condensate Return Valve Failure

Records reviewed and discussions with licensee representatives indicated that following successful operating cycles the condensate return valve V-14-34 failed to operate (final stages of plant cooldown). The overloads were found tripped, reset and the valve operated successfully. Current traces were taken and comparison with previous traces indicated no disparities. The licensee has replaced and tested the overloads. This matter was reported in a JCPL letter to the Directorate of Licensing dated September 18, 1973 and will be further reviewed during a subsequent inspection.

8. Other Engineered Safeguards

Hydraulic Shock and Sway Arrestor Failures

Preliminary and partial inspection results of hydraulic shock and sway arrestors located inside the drywell indicated 21 failures due to a loss of hydraulic fluid. Units outside the drywell had not been inspected at the conclusion of this inspection. This matter was reported in a JCPL letter to the Directorate of Licensing dated September 21, 1973 and will be further reviewed during a subsequent inspection.

9. Emergency Power

a. Power Loss and Associated Events

The inspector reviewed circumstances surrounding the power loss which occurred September 8 and resulted from inoperable startup transformers and/or an inability to carry other than minimal loads. The inspector determined based on records reviewed and discussions with cognizant licensee personnel that both diesel generators initially functioned to energize their appropriate buses when a low voltage was sensed and as required, picked up critical loads. Following a normal stop signal Diesel Generator No. 1 failed to restart upon receipt of a subsequent call for a "fast start," due to an engine trouble alarm requiring reset. The No. 2 diesel generator, however, did start as required and picked up critical loads. For a period of about 15 seconds (the time required for Diesel No. 2 to come up to speed and pick up critical load) no AC power was available at the site. The basis for Technical Specification 4.7 references verification that

generators can start and assume load in less than 20 seconds. The No. 1 diesel was reset and "fast started" and the No. 2 diesel was apparently subsequently secured and then also failed to restart on receipt of a subsequent fast start signal due to an engine trouble alarm requiring reset, was reset and initiated a "fast start."

b. Sequence of Events - September 8, 1973 (Re-creation)

A review of permanent plant records, analysis of the events recorder and attendant discussions with a licensee representative indicated the following:

Time Frame

T=0 (69 secs prior to scram)

(1) Plant personnel attempted to transfer house loads to startup transformer S1A. The reactor was operating at 90 MWe.

(2) S1A breaker tripped. (Auxiliary feed to bus)

(3) The "A" condensate and "A" feedwater pump were lost.

(4) The No. 1 "A" diesel came on fast start.

(5) A 1/2 scram occurred.

(6) 1C bus was re-energized.

(7) Plant personnel tried to start the "B" and "C" condensate pumps unsuccessfully. (Fed from B bus) Discussion indicated that apparently neither pump started, nor did a bus trip occur.*

(8) Plant personnel again attempted unsuccessfully to achieve closure on the S1A breaker.

T=69 secs (9) 6:56 A.M. The reactor scrammed on low water level. (One sensor in protection system 2 - see previous half scram)

T=75.7 secs (10) Follow-up action with manual scram was initiated.

(11) A proper transfer to S1B was made.

* Unresolved item.

T=96 secs (12) Scram signal from high scram discharge volume was received (37 gallons).

(13) S1A breaker was closed. The No. 1 diesel generator was synchronized to the 1A bus and in doing so the 1C breaker was closed.

(14) Normal stop signal to Diesel No. 1.

(15) A diesel generator trouble alarm was received.

(16) An electrician was dispatched to the diesel generator building.

(17) Plant personnel attempted to start the "A" condensate pump.

(18) The S1A breaker tripped.

(19) The No. 1 diesel could not fast start (engine lock out).

(20) Plant personnel tried to start the B or C condensate pump.

(21) S1B tripped (fed from outside power).

(22) Diesel Generator No. 2 fast started - While the diesel was fast starting there was no power to the station for about 15 seconds.*

(23) Approximately 6:59 A.M. At this time the electrician reset the No. 1 diesel and it restarted in the "fast start" mode (still sensing a dead bus signal).

(24) The second CRD pump was started.

(25) The CRD bypass valve was opened.

T=176.4 secs (26) The manual scram was reset.

(27) Protection system No. 1 was re-energized from the transformer.

T=180.7 secs (28) Condenser low vacuum alarm.

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* Based on review of available records, this loss was the longest period experienced without power.

(29) Indication of MSIV closure - Events recorder showed 2K-17 and 2K-18 - NS03B and NS04 closure. Supervision verified closure.

(30) The No. 2 diesel was running with power to 1B and probably 1C.

(31) Reset and trip on low water level (swell).

T=1hr-10min (32) Approximately 8:06 A.M. Final reset on low reactor water level alarm.

(33) Trip and reset of the manual scram.

(34) Main steam line low pressure trip and reset.

(35) SA and SB were reset simultaneously.

(36) No. 2 diesel was paralleled with the B bus and 1D breaker closed.

(37) No. 2 diesel was tripped - (Normal stop).*

(38) Trouble alarm.

(39) Operating staff tried to start B or C condensate pump.

(40) S1B tripped.

(41) No start on Diesel No. 2.

(42) Electrician reset the alarm.

(43) Both diesels were running, and 2 CRD pumps were on.

(44) Relay problem was resolved.

T=1hr-35min (45) Approximately 8:30 A.M. Normal power was restored.

c. Diesel Trouble Alarm and Engine Lock Out

Discussions with licensee representatives indicated that the trips of diesel generators Nos. 1 and 2, when secured via a

* Records reviewed did not provide verification of this time.

normal stop signal following a fast start actuation occurred as a result of the associated engine lock out relay being actuated. This action occurred as soon as the fast start relay was de-energized. The engine lock out relay was actuated through contacts of the engine speed relay (normally closed with the unit running) and the bearing oil pressure relay (normally open with sufficient pressure available). The reason for the closed oil pressure contacts in the engine lock out circuit was attributed to open contacts supplying logic power due to energization of the fast start relay. The inspector was advised that this problem was inherent in the circuitry and that General Motors had been contacted with respect to modifications. The inspector asked licensee representatives why surveillance testing (fast start) had failed to disclose this deficiency. A licensee representative stated that the deficiency may have been identified and went unnoticed referencing the infrequency of automatic actuation tests. Technical Specification 4.7.A.2 requires performance of this test each refueling outage. Records indicate that these requirements have been satisfied. A PORC review had not been conducted at the conclusion of the inspection. This matter was discussed at the exit interview.*

d. Inoperable Start up Transformers**

Records of relay testing and discussions with licensee representatives indicated that following relay testing performed on July 30, 1973 the current transformer ratio matching taps for the C phase differential relay on both startup transformers were inadvertently left in the test position. Test record notations indicated a trip test was not performed at this time. With the taps in an improper position when attempts were made to start or carry substantial loads a differential fault current provided a trip of bus supply breakers. (Violation, Technical Specification 3.7.A.2)

10. Radiation Protection

a. Stack Releases

A review of recorder chart records for the period September 8-9, 1973 indicated that continuous monitoring was provided on both

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* The inspector was informed subsequent to the inspection that a PORC review was conducted prior to startup.

** A review of records and discussions with licensee representatives indicated that events and corrective action was as subsequently stated in JCPL letter to Licensing dated September 18, 1973.

channels (A and B) during the power loss occurrence of September 8. Resulting readings when converted by $\frac{48\ \mu Ci/sec}{cps}$ indicated that just prior to the scram the release rate was 7,200 µCi/sec. The peak release of short duration just following the scram as indicated on Channel A was 33,600 µCi/sec. Discussions with licensee representatives indicated that this activity was routinely anticipated. An additional 2 peaks of lesser magnitude were also evidenced. Subsequently the stack release rate was maintained at about 4,800 µCi/sec until 6:40 P.M. on September 8. The release rate peaked at 96,000 µCi/sec. A review of the Shift Foreman's log and Station Operating Log for September 8 indicated that the increase in the release rate was caused by turning on the Condenser Mechanical Vacuum Pump. The pump was turned off and plant supervision notified. The pump was restarted and the release rate increased to 72,000 µCi/sec, and was secured. A subsequent restart resulted in a release rate of 52,800 µCi/sec which diminished in approximately 90 minutes to 4,800 µCi/sec.

The activity was attributed to Xe-133 and Xe-135. Attendant calculations indicated $\overline{E}$ values of 0.1 to 0.2. Technical Specification 3.6.A limits the maximum release rates of gross activity, except iodines and particulates with half lives longer than eight days in accordance with the following:

$$Q = \frac{0.21}{\overline{E}}\ Ci/sec$$

Where Q = the stack release rate (Ci/sec) of gross activity and
$\overline{E}$ = the average gamma energy per disintegration (MEV/dis).

Based on the above records and calculations no releases in excess of 10 CFR Part 20, Appendix B limits were apparent.

b. Procedural Control

Grab sample requirements and deficiencies were discussed with licensee representatives. Plant management in this instance provided $\overline{E}$ values to the operating shift.

The inspector discussed the licensee's reliance on previous operating history to provide verification of $\overline{E}$ accuracy. The inspector noted that procedures denoting operator action concerning grab samples were designed for reactor operation at

power and not in the shutdown mode. A licensee representative was informed of the inspector's position that grab sampling was considered appropriate.

c. Stack Monitor Calibrations

Calibration records for RN03A and RN03B for the period April 12-July 12, 1973 indicated calibrations had been performed in accordance with Technical Specification 4.6.A utilizing Co-60, Cs-137, Ba-133 and Na-22 sources. No calibration deficiencies were noted.

d. Activity in the Drywell

The inspector reviewed Occupancy Time Calculation sheets for the period September 8-9, 1973. An air sample analysis taken at 10:05 A.M. (3 hours following the scram) indicated the following:

(1) Xe-133 $\frac{\text{concentration}}{\text{MPC}} - \frac{5.14 \times 10^{-5}}{1 \times 10^{-5}} = 5.14$ ratio number

(2) Xe-135 $\frac{\text{concentration}}{\text{MPC}} - \frac{1.35 \times 10^{-5}}{4 \times 10^{-6}} = 3.375$

(3) $\frac{\text{40 hours}}{\text{Ratio No}} = \frac{40}{8.515} = 4.69$ hours

Based on a 4.69 hour occupancy entry was not permitted. The inspector reviewed additional analyses of samples taken between 10:00 A.M. September 8 and 5:30 A.M. September 9. At 12:30 A.M. September 9, calculations indicated a 97.49 hour occupancy. Drywell entry other than for sampling was not permitted until about 1:45 A.M. on September 9, 1973. Activity levels in the drywell were compared with previously analyzed samples taken during the period July 20-21, 1973 and during the April refueling outage. Occupancy time variation was essentially similar in nature. Based on the above the licensee's evaluation and restriction of entry appeared prudent and routine in nature. Entry was not permitted before 40 MPC hours were available.