UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

APR 12 1982

SSINS: 50-369

01-59-553

Action

MEMORANDUM FOR: D. G. Eisenhut, Director, Division of Licensing
Office of Nuclear Reactor Regulation

FROM: J. A. Olshinski, Director
Division of Engineering and Technical Programs

SUBJECT: LOSS OF HIGH HEAD INJECTION CAPABILITY AT MCGUIRE UNIT 1 AND RECONSIDERATION OF TECHNICAL SPECIFICATIONS 3.0.3 and 3.5.2

On February 12, 1982, while operating at 50% power, McGuire Unit 1 experienced a loss of both high head safety injection centrifugal charging pumps (CCP) due to entrainment of hydrogen gas in the suction line. The related LER that was submitted describing the event is attached as Enclosure 1. Region II's preliminary evaluation of this event indicated both design and operational concerns.

The design concern is that a single failure in the non-safety related hydrogen dampener for the positive displacement pump (PDP) can disable both trains of the safety-related centrifugal charging pumps. Region II issued a Confirmation of Action letter on March 25, 1982 (Enclosure 2) to confirm isolation of the hydrogen dampener system from the high head safety injection system. Although our preliminary discussions with Westinghouse indicated that this particular dampener system may be a unique design, Region II forwarded a proposed Information Notice (Enclosure 3) on the event to the Office of Inspection and Enforcement because of the possibility of existence of similar, if not identical, dampening systems. A proposed Abnormal Occurrence report (Enclosure 4) has been prepared and forwarded to AEOD.

The operational concern (Enclosure 5) raised by the McGuire Senior Resident Inspector involved the action statement required by the applicable technical specification in this event. We view the concern on the action statement as a valid concern, but recognize that selecting the "safe direction" for the action statement is dependent on a number of assumptions including the probability of correction of the problem prior to loss of pressure control. We therefore request that NRR review the adequacy of the Action Statement for this Technical Specification as described in Enclosure 5.

My staff is available to discuss any questions or concerns you may have regarding this event.

John A. Olshinski

Enclosures:
(See Page 2)

A/3

CONTACT: Richard L. Fiedler
(242-5550)

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~~CF ADOCK 05000369~~
CF

Enclosure 1

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

March 24, 1982

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Re: McGuire Nuclear Station Unit 1
Docket No. 50-369

Dear Mr. O'Reilly:

Please find attached Reportable Occurrence Report RO-369/82-15. This report concerns T.S.3.1.2.4, "At least two charging pumps shall be operable..."; T.S.3.1.2.2, "At least two of the following three boron injection flow paths shall be operable..."; and T.S.3.5.2, "Two independent ECCS subsystems shall be operable with each subsystem comprised of: a. one operable centrifugal charging pump." This incident was considered to be of no significance with respect to the health and safety of the public.

An update to this report will be provided when the final corrective action has been determined.

Very truly yours,

William O. Parker, Jr.

William O. Parker, Jr.

PBN/jfw
Attachment

cc: Director
Office of Management and Program Analysis
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Records Center
Institute of Nuclear Power Operations
1820 Water Place
Atlanta, Georgia 30339

Mr. P. R. Bemis
Senior Resident Inspector-NRC
McGuire Nuclear Station

8204080073

DUKE POWER COMPANY
McGUIRE NUCLEAR STATION
REPORTABLE OCCURRENCE REPORT NO. 82-15

REPORT DATE: March 24, 1982

FACILITY: McGuire Unit 1, Cornelius, NC

IDENTIFICATION: Loss of Both Centrifugal Charging Pumps (CCP) When Hydrogen (H_2) from the Reciprocating Charging (PD) Pump Suction Dampeners Entered the Suction of the Centrifugal Charging Pumps

DISCUSSION: On February 12, 1982, during an attempt to fill and vent the PD pump suction piping in preparation for returning the pump to service, opening valve INV-217 (suction isolation to the PD pump) resulted in air and H_2 in the PD pump suction piping flowing into the common suction of the two CCP's. Control room personnel noticed that CCP 1A motor current and charging flow had begun to oscillate, indicating cavitation, and thus subsequently swapped to CCP 1B and tripped CCP 1A. Approximately 30 seconds later, CCP 1B began to cavitate and was tripped. This resulted in charging and letdown being secured.

Both CCP's were declared inoperable at 2058 while unit 1 was in mode 1, 50% power operation. This incident is reportable pursuant to Technical Specifications 3.1.2.4, 3.1.2.2, and 3.5.2.

When the Nuclear Equipment Operator (NEO) who had opened the valve heard a page announcement that charging had been terminated he immediately called the control room. As a result of his call, the control operators then suspected that gas from the PD pump suction was entering the CCP suction, and instructed him to reclose the valve.

The Shift Supervisor and three NEO's vented CCP 1B and 1A through the overflow piping. However, when CCP 1B was restarted it immediately began cavitating, and was again tripped. After donning anti-C's and shoe covers, the Shift Supervisor entered the pipe chase and vented the suction pipes for both pumps, one at a time, for a total of approximately five minutes. During this time, the NEO's revented CCP 1B. Pump 1B was restarted and verified to operate properly after which charging and letdown were re-established.

EVALUATION: Due to the pulsating suction flow, characteristic of reciprocating pumps, the PD pump is equipped with a suction dampener consisting of a vertical section of twelve inch pipe with H_2 gas overpressure. The water level is controlled by two solenoid valves which supply gas when the water level is too high and vent off gas when the water level is too low. These valves can be controlled automatically by level switches, or manually by switches mounted on a local panel.

After the event, a check of the dampener level control system found the reference pot and leg empty. An empty reference leg would indicate high water level to the level switches which would result in a continuous supply of H_2 to the

dampener. The glass cover and meter movement of the level switch for valve 1NV-838 were also found damaged, but the effect of the damage on switch operation could not be determined. The means by which the reference leg was drained could not be determined. No leaks were found when the reference leg and pot were refilled.

The PD pump was isolated and drained in order to install instrument taps and pressure sensing devices for a station modification. After draining, the vent and drain valves were closed. Level in the reference leg was apparently lost while the piping was isolated since it had worked properly before but not after this period. When the NEO's attempted to fill the system, a slight hiss was heard. The NEO was not concerned because he knew that H_2 gas was involved in the dampener operation. Actually, this indicated that the level controls might not have been working properly (supplying H_2 when it should have been vented).

The NEO was likewise not concerned by the sound of water flow when he opened the PD pump suction valve because he expected water to flow into the PD pump suction.

Hydrogen header pressure supplying the dampener was approximately 110 psig which could easily displace water in the charging pump suction piping. Judging by the volume control tank level changes during the event, it is estimated that about fifty cubic feet of water was displaced by the gas. VCT overpressure generally ranges from 50 - 30 psig.

The H_2 released to atmosphere did not fill any of the areas to concentrations sufficient to cause combustion as a result of a spark. Hydrogen and air in the piping was in no danger of combustion due to the absence of an ignition source.

SAFETY ANALYSIS: When the CCP's were inoperable, no emergency core cooling was available above 1500 psig (safety injection pump shutoff head). Emergency boration and reactor coolant makeup were also not available during this period. Any significant decrease in T_{ave} would have resulted in a corresponding drop in pressurizer level but system pressure could have been maintained by the pressurizer heaters until level dropped below 17%. It was essential that the unit be maintained in a steady state condition until charging and letdown could be restored.

The unit remained in a steady state condition during the incident and the health and safety of the public were not affected.

If the restoration of makeup coolant flow had been delayed until after the pressurizer inventory was lost, or had a transient occurred forcing a loss of pressurizer inventory, a reactor trip would have ensued. With the loss of pressurizer water, loss of pressure control would occur. The lower limit of the pressure excursion would be determined by system hot spot saturation pressure. Forced core cooling would continue unless system pressure loss or system voiding required stopping the pumps at which time natural circulation

would provide the means for core heat removal. Reactor coolant temperature trends would be dependent on steam generator heat transfer rates and core decay heat generation.

When reactor coolant system pressure decreased to below 1500 psig, the safety injection pumps would begin to refill the system. Safety injection would continue until pressurizer pressure control was regained.

Steam generator water level, steam flow, and feed flow affect steam generator heat transfer and the reactor coolant natural circulation rates. The steam generator parameters are relatively simple to control; therefore, the recovery from the postulated loss of makeup flow incident is considered to be within the capabilities of the station.

CORRECTIVE ACTION: The immediate corrective action was to secure the CCP's, isolate the PD pump suction, vent the CCP's and suction piping, and to return CCP 1B to service. CCP 1A was tested and returned to operable status later the same day.

Due to several incidents including this one, a memorandum to standardize the practice of isolating and draining equipment has been distributed. Effective February 25, it is required that at least one drain and/or vent be red tagged open when any component is isolated for maintenance. Although such action may not have prevented this incident, it is good operating practice which was not followed in this instance.

The PD pump and suction dampener have been isolated from the charging system. Duke Power Company is evaluating the system design to determine what temporary and/or permanent changes are necessary to prevent recurrence of this type event. The PD pump will not be returned to service until such a temporary or permanent change is made. A followup report describing any temporary changes made to the system and permanent changes planned will be submitted when these evaluations are complete.

NRC FORM 366 (7-77)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

EXHIBIT A

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 | N C M G S 1 (2) | 0 0 - 0 0 0 0 0 - 0 0 (3) | 4 1 1 1 1 (4) | | | (5)
LICENSEE CODE — LICENSE NUMBER — LICENSE TYPE — CAT

CON'T 0 1 | REPORT SOURCE L (6) | 0 5 0 0 0 3 6 9 (7) | 0 2 1 1 8 2 (8) | 0 3 2 4 8 2 (9)
DOCKET NUMBER — EVENT DATE — REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 While in mode 1, during an attempt to fill and vent the reciprocating charging
0 3 pump (PD) suction piping in preparation for returning the pump to service, both
0 4 centrifugal charging pumps (CCP) were declared inoperable when hydrogen from the
0 5 PD pump suction dampeners entered the suction of the CCP's causing cavitation.
0 6 This violates T.S.3.1.2.4, 3.1.2.2, and 3.5.2 which is reportable per T.S.6.9.1.
0 7 12(e). Since the unit remained in a steady state condition until charging and
0 8 letdown were restored, the health and safety of the public were unaffected.

0 9 | SYSTEM CODE: P C (11) | CAUSE CODE: E (12) | CAUSE SUBCODE: X (13) | COMPONENT CODE: X X X X X X (14) | COMP. SUBCODE: Z (15) | VALVE SUBCODE: Z (16)

(17) LER/RO REPORT NUMBER | EVENT YEAR: 8 2 | — | SEQUENTIAL REPORT NO.: 0 1 5 | / | OCCURRENCE CODE: 0 1 | REPORT TYPE: T | — | REVISION NO.: 0

ACTION TAKEN: N (18) | FUTURE ACTION: N (19) | EFFECT ON PLANT: Z (20) | SHUTDOWN METHOD: Z (21) | HOURS (22): 0 0 0 0 | ATTACHMENT SUBMITTED: Y (23) | NPRD-4 FORM SUB.: N (24) | PRIME COMP. SUPPLIER: Z (25) | COMPONENT MANUFACTURER: Z 9 9 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 This incident resulted from the failure of the Hydrogen Control System on the PD
1 1 pump suction dampener (the reference pot and leg were found empty, cause unknown).
1 2 Immediate corrective action was to secure the CCP's, isolate the PD pump suction,
1 3 vent the CCP's and suction piping, and return the CCP's to service. Use of the
1 4 PD system will be discontinued until corrective action to prevent recurrence can
be determined and taken.

1 5 | FACILITY STATUS: E (28) | % POWER: 0 5 0 (29) | OTHER STATUS (30): N/A | METHOD OF DISCOVERY: A (31) | DISCOVERY DESCRIPTION (32): Personnel Observation

1 6 | ACTIVITY RELEASED: Z (33) | CONTENT OF RELEASE: Z (34) | AMOUNT OF ACTIVITY (35): N/A | LOCATION OF RELEASE (36): N/A

PERSONNEL EXPOSURES
1 7 | NUMBER: 0 0 0 (37) | TYPE: Z (38) | DESCRIPTION (39): N/A

PERSONNEL INJURIES
1 8 | NUMBER: 0 0 0 (40) | DESCRIPTION (41): N/A

LOSS OF OR DAMAGE TO FACILITY (43)
1 9 | TYPE: Z (42) | DESCRIPTION: N/A

PUBLICITY
2 0 | ISSUED: N (44) | DESCRIPTION (45): N/A | NRC USE ONLY

NAME OF PREPARER Phillip B. Nardoci PHONE: (704) 373-7432

Enclosure 2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

MAR 2 5 1982

Duke Power Company
ATTN: Mr. W. O. Parker, Jr.
Vice President, Steam Production
P.O. Box 2178
Charlotte, NC 28242

Gentlemen:

Subject: Confirmation of Action - Docket No. 50-369

This letter refers to the telephone conversation on March 24, 1982, between Mr. J. Olshinski of this office and Mr. H. Rutherford of your office concerning corrective actions on your reportable occurrence report No. 82-15. This pertains to the loss of both centrifugal charging pumps due to hydrogen entrainment when restoring the positive displacement (PD) pump to service at your McGuire Unit 1 facility.

Based upon the matter discussed, it is our understanding that the following actions were or will be promptly initiated:

1. Remove the PD pump from service and isolate from the charging system, the hydrogen controlled suction dampener.

2. Evaluate system design changes to prevent recurrence of this type of event.

3. Following any design changes and prior to returning the PD pump and suction dampener system to service, submit your evaluation to this office for our review.

Please note that the reporting requirements identified above are not subject to Office of Management and Budget clearance as required by P. L. 96-511.

If your understanding of our discussion is different from that stated above, please inform this office promptly.

Sincerely,

James P. O'Reilly
Regional Administrator

cc: H. B. McIntosh, Plant Manager
J. T. Moore, Project Manager

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