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October 27, 1992

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station Unit 1
Docket No. 50-369
Licensee Event Report 369/90-22, Revision 01

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 369/90-22, Revision 01, concerning the inoperability of both trains of the Residual Heat Removal System during quarterly valve stroke time testing. This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (i) and (vii). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

T.C. McMeekin

TLP/bcb

Attachment

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Office of Nuclear Reactor Regulation
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Mr. P.K. Van Doorn
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McGuire Nuclear Station

LICENSEE EVENT REPORT (LER)

FACILITY NAME(1)	DOCKET NUMBER(2)	PAGE(3)
McGuire Nuclear Station, Unit 1	05000 369	1 OF 11

TITLE(4) Both Trains Of The Residual Heat Removal System Were Inoperable During Quarterly Valve Stroke Time Testing Because Of Improper Scheduling.

EVENT DATE(5)			LER NUMBER(6)			REPORT DATE(7)			OTHER FACILITIES INVOLVED(8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(8)
									McGuire, Unit 2	05000 370
07	16	90	90	022	01	09	17	90		05000

OPERATING MODE(9)	1	THIS REPORT IS SUBMITTED PURSUANT TO REQUIREMENTS OF 10CFR (Check one or more of the following)(11)							
			20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
POWER LEVEL(10)	100		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)		50.36(c)(2)	X	50.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text)
			20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER(12)

NAME	TELEPHONE NUMBER	
	AREA CODE	
Terry L. Pedersen, Supervisor, McGuire Safety Review Group	704	875-4487

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT(13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED(14)		EXPECTED SUBMISSION DATE(15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines (16)

On July 11,1990, Performance (PRF) personnel prepared a reissue of procedure PT/2/A/4206/02B, Safety Injection (NI) Train B Valve Stroke Timing Quarterly. On July 16, 1990. PRF Engineer A performed the normal review of the procedure reissue. During the course of the review, PRF Engineer A, in conjunction with Operations personnel discovered that cycling valves 1 and 2NI-136B, Residual Heat Removal (ND) Heat Exchanger 1B and 2B To NI Pump 1B and 2B, while at power could degrade ND system operation in the event of a Large Break Loss Of Coolant Accident (LBLOCA). Degradation could occur when the valves were cycled to the open position. These valves have been routinely stroke time tested in Modes 1 (Power Operation), 2 (Startup), 3 (Hot Shutdown), and 4 (Hot Standby) since plant startup for each unit, respectively. Subsequently, it was determined that the same situation was also true for valves 1 and 2NS-38, ND Pump B To Containment Spray (NS) Nozzles Containment Isolation, and 1 and 2NS-43, ND Pump A to NS Nozzles Containment Isolation, during performance of procedures PT/1 and 2/A/4208/02A and B, NS Trains A and B Valve Stroke Timing Quarterlies. This incident is assigned a cause of Improper Scheduling of the valve stroke timing for these valves. Both units were in Mode 1 at 100 percent power at the time of this event discovery. Appropriate schedule changes have been implemented to ensure that the valves will be stroke time tested only when the units are shutdown.

EVALUATION:

Background

The primary function of the Residual Heat Removal System (ND) [EIIS:BP] is to remove heat energy from the Reactor [EIIS:RCT] Core and the Reactor Coolant System (NC) [EIIS:AB] during plant cooldown and refueling operations. The system is also utilized as a part of the Emergency Core Cooling System (ECCS). It has a secondary function of transferring refueling water between the storage tank [EIIS:TK] and the refueling cavity at the beginning and end of refueling operations.

The system has two parallel flow paths sharing a common inlet from the Containment Sump, the Refueling Water Storage Tank, or Reactor Coolant Loop C [EIIS:PSP]. The return lines connect to the cold leg of each reactor coolant loop. Each flow path contains an ND pump [EIIS:P], a heat exchanger (HX) [EIIS:HX], associated piping, valves [EIIS:V], and instrumentation required for operational control. During normal operation, the system is not in service but is aligned in readiness for operation as a part of the ECCS. Reference drawing page 6 of 6.

Technical Specifications (TS) 3.5.2 and 3.5.3 specify the requirements for the operation of the ND Pumps with respect to their ECCS function. Both pumps are required to be operable in Modes 1, 2, and 3. During operation in Modes 1, 2, and 3, when one train of ECCS becomes inoperable, the inoperable train must be returned to operable status within 72 hours, or the unit must be shutdown to Mode 4. If both trains of ECCS are inoperable, TS 3.0.3 applies, and the unit must be shut down to Mode 5 (Cold Shutdown) unless at least one train is made operable within an hour. TS 3.0.3 states that when a Limiting Condition of Operation and its associated action statements are not met within one hour, action must be initiated to place the affected unit in a mode in which the specification does not apply.

Description of Event

On July 11, 1990, Performance (PRF) personnel prepared a reissue of procedure PT/2/A/4206/02B, Safety Injection System (NI) [EIIS:BQ] Train B Valve Stroke Timing Quarterly. The reissue was done to incorporate timing requirements as specified by Generic Letter 89-04.

On July 16, 1990, PRF Engineer A began performing the normal review of the reissued procedure. During the course of the review, PRF Engineer A discovered the procedure required valve 2NI-136B, ND HX 2B To NI Pump 2B, be cycled to the open position. He then consulted with Operations personnel about possible consequences of cycling this valve. Upon investigation, it was determined that cycling this valve to the open position while at power could degrade ND system injection flow in the event of a Large Break Loss Of Coolant Accident (LBLOCA). This was also true for Unit 1 procedure PT/1/A/4206/02B, NI Train B Valve Stroke Timing Quarterly, and the corresponding Unit 1 valve.

PRF Engineer A determined that these valves have routinely been stroke time tested during Modes 1, 2, 3 and 4 since plant startup for each unit respectively. He then initiated Problem Investigation Report (PIR) 0-M90-0180 to resolve the problem. He also initiated appropriate procedure changes to ensure that these valves would only be stroke time tested during cold shutdown conditions.

In addition, on July 16, 1990, Design Engineering (DE) personnel began an evaluation to determine past operability of the ND system. During the course of their evaluation, DE personnel discovered that the same situation was also true for valves 1 and 2NS-38B, ND Pump B Discharge to NS Nozzles Containment Isolation, and valves 1 and 2NS-43A, ND Pump A Discharge To NS Nozzles Containment Isolation. They informed PRF Engineer A of this finding and he initiated appropriate changes to procedures PT/1 and 2/A/4208/02A and B. This will ensure that these valves will only be stroke time tested during cold shutdown conditions.

Conclusion

This event is assigned a root cause of Improper Scheduling by PRF personnel of the valve stroke timing for valves 1 and 2NI-136B, 1 and 2NS-38B, and 1 and 2NS-43A. These valves have routinely been stroke time tested in Modes 1, 2, 3, and 4 since plant startup for each unit, respectively.

It has been determined that the potential exists for the ND injection flow to be degraded if a LBLOCA occurred while these valves are open during testing. Since the valves have been tested quarterly per the Inservice Valve Testing (IWV) Program, the ND system was technically inoperable when past testing was executed during Modes 1, 2, 3, and 4.

PRF personnel involved in developing the procedures in question had not previously considered that cycling these valves at power could possibly degrade ND system operation during a LBLOCA. Therefore, the valves were scheduled for quarterly testing as required in accordance with IWV program guidelines. As soon as PRF personnel became aware of the problem, appropriate actions were implemented to ensure that these valves would be scheduled for testing only when the units are in cold shutdown.

A review of the Operating Experience Program data base for the past twenty-four months prior to this event revealed no events involving TS violations because of Improper Scheduling and specifically there were no events involving valve stroke time testing. Therefore, this event is not considered to be recurring.

This event is not Nuclear Plant Reliability Data System (NPRDS) reportable.

There were no personnel injuries, radiation overexposures, or uncontrolled releases of radioactive material as a result of this event.

CORRECTIVE ACTIONS:

Immediate: None

Subsequent:

1) PRF personnel made changes to remove valves 1 and 2NI-136B from procedures PT/1 and 2/A/4206/02B, NI Train B Valve Stroke Timing Quarterly, and add them to procedures PT/1 and 2/A/4206/03B, NI Train B Valve Stroke Timing Shutdown, respectively.

2) DE personnel performed an evaluation to determine past operability of the ND system, and discovered that valves 1 and 2NS-38 and 1 and 2NS-43 could have also degraded operability of the ND system during testing.

3) PRF personnel made changes to remove valves 1 and 2NS-38 and 1 and 2NS-43 from procedures PT/1 and 2/A/4208/02A and B, NS Trains A and B Valve Stroke Timing Quarterlies, and add them to procedures PT/1 and 2/A/4208/03A and B, NS Trains A and B Valve Stroke Timing Shutdown, respectively.

Planned: PRF personnel will initiate a Station Problem Report requesting a review to be performed by DE to identify if other valves in the IWV program have previously unidentified limitations on allowed plant mode for valve stroke time testing.

SAFETY ANALYSIS:

If a LBLOCA occurs while valve 1 or 2NI-136B, 1 or 2NS-38, or 1 or 2NS-43 are open during testing, the ND system injection flow could be degraded to less than the flow assumed for the Final Safety Analysis Report (FSAR) LOCA Analysis. These valves have been tested Quarterly in Modes 1, 2, 3, and 4 since Startup of each unit respectively. Therefore, the ND system was technically inoperable when past testing was executed each time any of these valves were in the open position.

The time period in question varied from test to test and valve to valve. However, this time would have, in each case, been very short. The actual stroke time of each valve is $\leq$ 10 seconds. The time to verify the valve position would have varied from test to test, and then the valves would have had to be cycled closed. The probability of one of the valves being tested and a LBLOCA occurring together is extremely low. Also, since the valves could be closed in an extremely short time (if the need arose) it can be concluded that no significant safety concerns resulted because of the low probability of two such events occurring simultaneously.

In the event that a LBLOCA did occur, Operations personnel would have been able to close these valves as necessary to mitigate any decrease in injection

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

flow. Operations personnel are in control of the valves during testing and only one train is tested at one time. In addition, the other ECCS systems would have been unaffected by the valves being open and should have been able to perform their safety function in addition to the flow that would have been provided by the ND system.

The health and safety of the public were not affected by this incident. During the time period when both trains of ND were technically inoperable no events occurred which required the actuation of ECCS.

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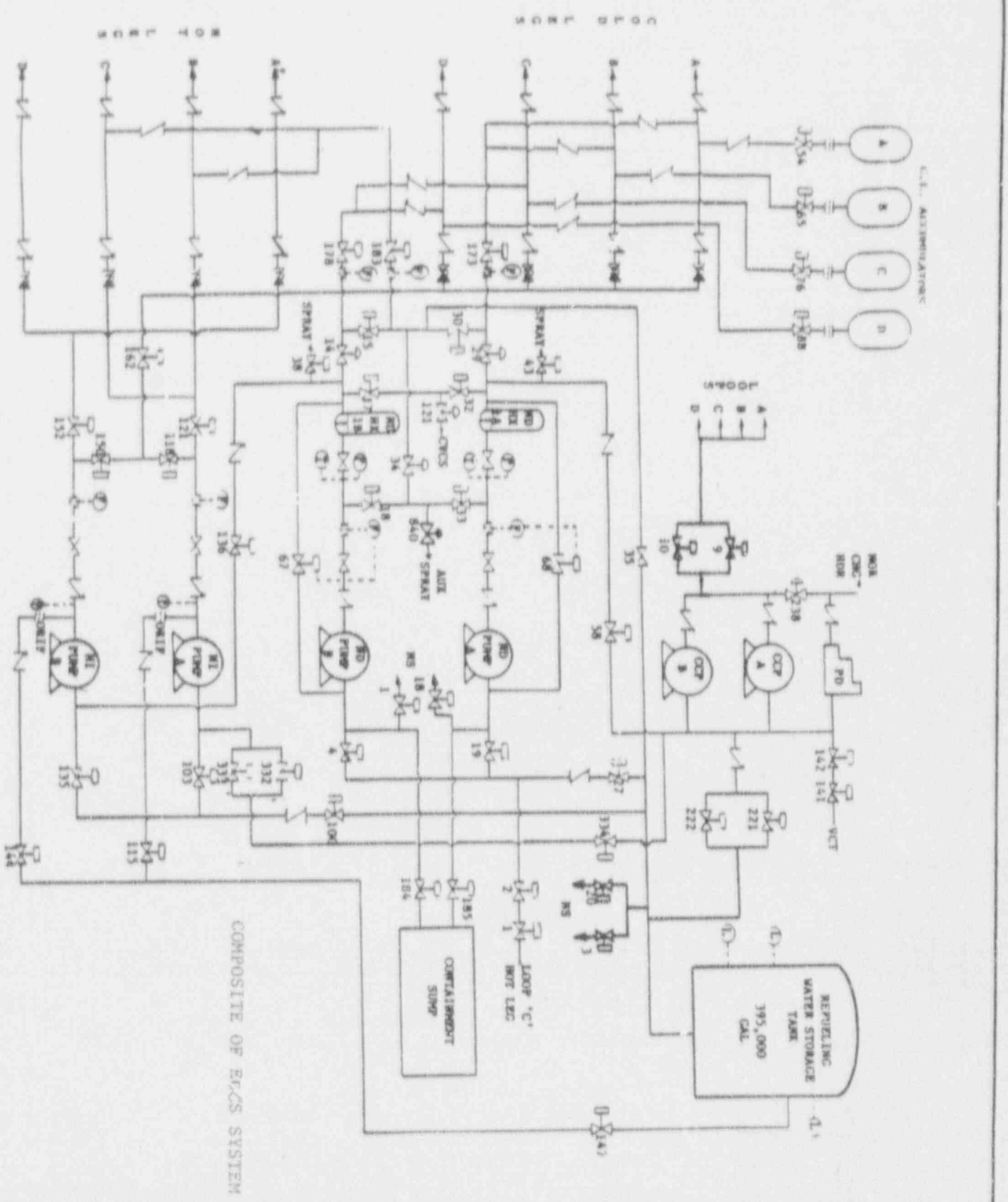

Additional Information:

On September 28, 1990, Station Problem Report (SPR) number 3710 was issued in response to the planned corrective action generated in revision 0 of this report. The SPR requested the performance of a design study to identify valves within the ECCS which have the potential to degrade safety related systems. The responsibility of performing this study was assigned to the System Engineering Group.

As a result of the study, a memorandum was issued on August 25, 1992, which identified 3 valves in the ECCS which have the potential to degrade the NI and Chemical and Volume Control (NV) systems [EIIS:CB] when quarterly valve stroke time testing is performed.

The valves involved are:

1) 1 and 2NI-103A, Safety Injection Pump 1A Suction.
2) 1 and 2NI-115B, Safety Injection Pump 1A Mini-Flow Line Isolation.
3) 1 and 2NI-334B, Safety Injection Pump Suction Cross To NV Isolation.

System Engineering personnel determined when valve NI-103A is cycled to the closed position, a loss of Train A power would render Train B of the NV system inoperable. During the Recirculation Phase of a Safety Injection, the flowpath of ND Train B to the NV pump suction is through valve NI-103A.

When valve NI-115B is cycled to the closed position, a loss of Train B power would render Train A of the NI system inoperable. When a Safety Injection signal has occurred, and the NC system pressure is above the shutoff head for the NI pump, the NI pump would not have a flowpath, since valve NI-115B is in the flowpath for the miniflow protection of the Train A, NI pump.

When valve NI-334B is cycled to the closed position, a loss of Train B power would render Train A of NI inoperable. During the Recirculation Phase of a Safety Injection, the flowpath of Train A of ND to the NI pump suction is through valve NI-334. (Reference pg. 10 of 10).

The immediate corrective action taken to prevent degradation of the involved systems was the cessation of the quarterly valve stroke testing on the affected valves. American Society of Mechanical Engineers (ASME) code article IWV 3412 states, "valves that cannot be exercised during plant operation shall be specifically identified by the Owner and shall be full stroke exercised during cold shutdowns." On August 25, 1992, System Engineering personnel issued a memorandum to the affected station groups requesting valves 1 and 2NI-103A, 1 and 2NI-115B, and 1 and 2NI-334B be removed from quarterly valve stroke testing and advised that the valves

would be moved to the Cold Shutdown List for valve stroke timing. System Engineering personnel also updated the McGuire Pump and Valve Inservice Testing (IWV) Manual to reflect this change. Due to the similarity of the ECCSs, McGuire Nuclear Station (MNS) System Engineering personnel shared the results of the design study with Catawba Nuclear Station (CNS) Engineering personnel.

In addition to the NI and NV systems experiencing potential degraded scenarios during valve stroke testing, the potential also existed for the same system degradation during the performance of maintenance on these valves. Valves 1 and 2NI-147A, NI Pumps Mini-Flow Header To FW (refueling water storage tank), which fall into this category, were added to the original 3 valves. When valve NI-147A is closed for maintenance, a loss of Train A power would render Trains A and B of the NI system inoperable. During the Injection Phase of a Safety Injection, the miniflow path for the NI pumps is through valve NI-147A. As part of the ECCS, it is unlikely this valve would be closed for maintenance during Mode 1 through Mode 4 as this valve is TS related and required to be opened with control power from the valve operator removed.

On August 27, 1992, Operations Management issued Operations Management Procedure (OMP), section 2-1, Attachment 3, Operations Special Order number 92-23 which explained the potential problem, and listed the affected valves. The Special Order requested that the valves were not to be repositioned unless directed by an approved emergency or abnormal procedure (EP or AP). If there were any questions, unit staff personel were to be contacted.

Additionally, an extensive work history review was conducted on Units 1 and 2 by Safety Review Group personnel to determine if there was any past preventive maintenance (PM) or corrective maintenance performed on the affected valves that would have caused a potential degradation of the safety related systems within the ECCS. The review covered all work requests associated with the valves from August, 1988, to the present. The results of the review revealed that the majority of work performed was done during unit outages. The work performed during non outage intervals revealed work performed on valves 1NI-103A and 2NI-103A which had the potential to degrade safety related systems. On September 21, 1988, under work request 68374, valve 1NI-103A was cycled closed as part of the Motor Operated Valve Analysis and Testing System (MOVATS), and on October 3, 1988, under work request 135461, valve 2NI-103A was cycled closed twice, as part of work performed on the 1.47 Bypass Panel.

A risk potential assessment was performed on valves NI-103A, NI-115B, and NI-104B by the Safety Analysis Accident Group. A failure mode for valve NI-103A is included in the McGuire Probabilistic Risk Assessment (PRA) model, which corresponds to a valve unavailability of approximately 1.3 hours per year. During the year, the valve is closed for < 8 minutes per year as a result of testing, which is less than the PRA assumed unavailability.

Additionally, valves 1 and 2NI-103A were cycled closed for short periods of time during corrective maintenance, in 1988. However, the total valve unavailability for 1988, is still less than the yearly PRA assumed unavailability. The core melt cut set (the combination of different failure modes of different pieces of equipment) associated with this failure mode has a frequency not greater than 1.0 E-8 per year.

Valve NI-115B has been qualitatively dismissed as inconsequential in the McGuire PRA because if the NC system is above the shutoff head of the NI pump for Safety Injection sequences, it is assumed the NV pump is operating successfully. The added redundancy of the NI system is not necessary to avert core damage. If the secondary side heat sink is lost, a bleed path must be established before the primary side pressure rises above the NI pump shutoff head. If this is not done, the result would be a failure anyway. For the above reasons, the NI miniflow path is not critical to averting core damage.

Valve NI-334B is not included in the McGuire PRA core melt cut set, however, the common cause failure of valves 1 and 2 NI-332A and NI-333B (NV and NI Pumps Suction Crossovers), does appear in the model. The failure mode which directly corresponds to the unavailability of valve NI-334B, is equivalent to 1.7 hours per year. During the year, the valve is closed for < 48 minutes per year as a result of testing, which is less than the PRA assumed unavailability. The core melt cut set associated with the failure mode has a frequency not greater than 1.0 E-8 per year.

It can be concluded that the unavailability of the subject valves due to testing does not contribute significantly to core damage risk, and does not contribute significantly to ECCS unavailability.

It has also been determined by Operations, System Engineering, and Safety Review Group personnel that if in fact the event did present itself, there are emergency operating procedures, EP/1,2/A/5000/02, High Energy Line Break Inside Containment, and EP/1,2/5000/06, Loss Of Emergency Coolant Recirculation, which direct OPS personnel of the steps to take in order to mitigate the circumstances.

For future reference, Mechanical Engineering personnel will revise the McGuire Design Basis Document (DBD) to include information relating to this design study.

System Engineering personnel will also perform a design study on the Auxiliary Feedwater (CA) [EIIS:BA], Main Feedwater (CF) [EIIS:SJ], Diesel Generator Engine Fuel Oil (FD) [EIIS:DC], Component Cooling (KC) [EIIS:CC], Diesel Generator Engine Cooling Water (KD) [EIIS:LB], Diesel Generator Engine Lube Oil (LD) [EIIS:LA], Nuclear Service Water (RN) [EIIS:BI], Main Steam Supply to Auxiliary Equipment (SA) [EIIS:SA], Control Area Heating Ventilation and Air Conditioning (VC) [EIIS:VI], Annulus Ventilation (VE) [EIIS:VD], Containment Air Return

Exchange and Hydrogen Skimmer (VX) [EIIS:BB], and Chilled Water (YC) [EIIS:KM] systems to determine if valves in those systems have the potential to degrade safety related systems when stroke timing and/or maintenance activities are performed on the valves during modes they are required to be operable.

ADDITIONAL CORRECTIVE ACTIONS:

Immediate: System Engineering personnel issued a memo to affected station personnel to immediately cease quarterly stroking of the subject valves.

Subsequent:

1) System Engineering personnel updated the Unit 1 IWV Manual to reflect the change in the valve stroke timing test frequency.

2) MNS System Engineering personnel notified CNS Engineering personnel of the results of the design study.

Planned:

1) A design study will be performed on the CA, CF, FD, KC, KD, LD, RN, SA, VC, VE, VX, and YC systems by System Engineering personnel to determine if valves in those systems have the potential to degrade safety related systems when stroke timing and/or maintenance activities are performed on the valves during modes they are required to be operable.

2) For future reference, Mechanical Engineering personnel will revise the McGuire DBD to include information related to the design study.

3) System Engineering personnel will update the Unit 2 IWV Manual to reflect the change in the valve stroke timing test frequency, during the next submittal to the NRC.

4) Safety Review Group Management personnel will broadcast the results of the design study through the Nuclear Network System.

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Woods Model of ECCS during Recirculation Phase