

Duke Power Company
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078-8985

(704)875-4000



DUKE POWER

April 22, 1993

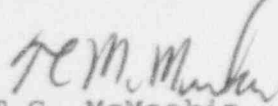
U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station Unit 2
Docket No. 50-370
Licensee Event Report 370/93-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/93-03 concerning a manual actuation of an ECCS pump due to a leak on the charging header. This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (vii). Based upon the recent publication in the Federal Register Vol 58, No. 66, dated Thursday, April 8, 1993, it appears that this event may not meet the reporting criteria of 10 CFR 50.73 (a) (2) (vii). We are submitting this report while continuing discussions with the NRC and may retract this LER at a later date. 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

xc: Mr. S.D. Ebnetter
Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta St., NW, Suite 2900
Atlanta, GA 30323

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339

Mr. Victor Nerses
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Mr. P.K. Van Doorn
NRC Resident Inspector
McGuire Nuclear Station

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LICENSEE EVENT REPORT (LER)

FACILITY NAME(1) McGuire Nuclear Station, Unit 2							DOCKET NUMBER(2) 05000 370		PAGE(3) 1 OF 8	
TITLE(4) A Manual Actuation of an ECCS Pump Due to a Leak on the Charging Header Caused by a Construction/Installation Deficiency and a Management Deficiency.										

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)
03	22	93	93	03	0	04	22	93		05000
										05000

OPERATING MODE(9)		1	THIS REPORT IS SUBMITTED PURSUANT TO REQUIREMENTS OF 10CFR (Check one or more of the following)(11)							
POWER LEVEL(10)		100%	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)				
			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)	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)(ix)					

LICENSEE CONTACT FOR THIS LER(12)

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

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS

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 March 22, 1993, at 1450, Mechanical Maintenance shift personnel were attempting to repair a broken instrument hanger associated with the Chemical and Volume Control System charging header pressure instrument. The maintenance personnel were working under work order 93003839, task 2. This task required the instrument root valve to be isolated, prior to the work being performed. This was not done. During the work, a 1/2 inch Parker Hannifin instrument tube fitting failed which created a leak of approximately 80 gallons per minute. Operations personnel implemented procedure AP/2/A/5000/10, NC System Leakage Within The Capabilities Of The Charging Pump, to respond to the leak. The leak was isolated by a Radiation Protection Specialist, within 13 minutes. Due to indications found during repair of the failed fitting, this event is assigned a cause of Construction/Installation Deficiency, because the fitting was not properly swaged. This event is also assigned a cause of Management/Quality Assurance Deficiency due to the breakdown in the work control process, and a cause of Improper Action. The immediate corrective action for this event was to have Instrument and Electrical personnel repair the leak. Additionally, a team of Station Management personnel assembled to define and identify the process to determine whether this event may indicate a generic station problem with compression fittings. Unit 2 was operating in MODE 1 (POWER OPERATION) at 100 percent power at the time of the event. This event is reportable due to the manual starting of a Charging Pump.

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EVALUATION:

Background

Instrument tubing [EIIS:TBG] is routinely used to allow a fluid connection between a process variable and a measuring device. The tubing is typically routed on the most direct path possible from the measured process fluid to the measuring device or instrument. This routing however, often requires changes in elevation or direction which necessitates the use of compression fittings to join two pieces of tubing.

A compression fitting is made up of three parts, excluding the tubing itself, which when positioned properly will act upon each other to create a joint that does not leak. The parts of the joint are the fitting body, the fitting nut and the ferrule. When the fitting is initially made, the tubing is inserted into the fitting nut and the ferrule. The ferrule is a hollow cone shaped piece with the narrow end positioned toward the fitting body. The fitting body, which has threads on its outside diameter, is slightly convex at its end. The tubing is inserted fully into the fitting body. Then the ferrule is inserted so that the cone shape will come into contact with the convex portion of the fitting body. Lastly, the fitting nut, which presses on the exposed end of the ferrule, is threaded onto the fitting body. The fitting nut, by being threaded onto the fitting body with sufficient force, will cause the ferrule to create a small amount of plastic deformation of the tubing, where there is contact between the two. This deformation will cause a slight expansion of the portion of the tubing that extends beyond the end of the ferrule into the fitting body. This process of tube deformation is known as swaging.

The Chemical and Volume Control (NV) system [EIIS:CB] is described in chapter 9 of the Final Safety Analysis Report. One of its purposes is to act as the high head portion of the Essential Core Cooling System (ECCS) to inject water into the Reactor Coolant (NC) system when required during a Loss of Coolant Accident (LOCA).

Description of Event

On January 14, 1993 work order (WO) 93003839 was generated, to repair a leaking compression fitting in the Auxiliary Building [EIIS:NF] pipechase. This WO had two separate tasks to be performed. The first was to repair a leak at a fitting on the instrument tubing for 2MNVPT-5620 NC system charging header pressure transmitter. The first task, 93003839-01, was performed on January 15, 1993, by an Instrumentation and Electrical (IAE) Shift Supervisor. The IAE Supervisor, who performed the work, isolated the instrument root valve (RV) [EIIS:RV] and proceeded to repair the leak per procedure IP/O/A/3090/05, Installation And Maintenance Of Instrument Line Fittings And Tubing. After the fitting nut was tightened, the RV was

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opened and a functional verification was performed. No leakage was observed. The WO indicated the failure was due to a red head anchor, that bolts the instrument hanger to the wall, being pulled from the wall. Without this anchor, the weight of the instrument tubing was supported by the 90 degree fitting causing it to leak. Task 2 of WO 93003839, which was to repair the instrument hanger, required the RV to be isolated and tagged prior to the work being performed. This WO task was held by the Work Control (WC) department to await scheduling.

On January 26, 1993, while performing a housekeeping inspection, a Radiation Protection (RP) Supervisor discovered that this same 90 degree elbow fitting was again leaking, and made a note of this leak in his housekeeping records. During the RP Supervisors housekeeping trip in February, he again noticed the leak and after some planning to help reduce personnel radiation dose, initiated WO 93016559-01 on March 1, 1993, to have the leak on 2MNVLP-5620 repaired.

During the planning process, it was recognized that there was still an outstanding WO to be completed on this instrument line to repair the hanger which supports the instrument tubing. This outstanding WO caused the task description of WO 93016559-01 to state "Note: This fitting was tightened on WO 93003839-01. Task 02 has not been done, probably resulting in the leak recurring. Perform 93003839-02 with 93016559-01 for re-work of the fitting leak. Save all damaged parts." Both WOs were placed on the shift schedules, 93003839-02 for Mechanical Maintenance (MM) and 93016559-01 for IAE, for March 9, 1993. However, neither WO was implemented on that day and the WOs were returned to WC.

The flow path, as specified in Maintenance Management Procedure (MMP) 2.0, for work to be performed is for WC personnel to deliver the WOs, to the station group having operational control of the equipment to be repaired, in the evening of the day prior to the scheduled work date. On the night of March 18, 1993, WO 93016559-01 was delivered to the Operations Assistant Shift Supervisor (ASST) having responsibility for Unit 2. The ASST read the description of the work to be performed and signed the WO granting clearance to begin work the next day. Work Order 93016559 was returned to WC at the end of the day, with no work having been performed. The WO for repair of the tubing support, 93003839-02, was placed on the MM schedule for March 22, 1993. This WO was sent to the same Operations ASST on the evening prior to the scheduled date to receive permission to begin work. During the interview, the ASST stated that he remembered the previous WO, 93016559-01, which he had signed and that he noticed that this WO was for the same instrument loop. He also stated that he remembered the task description from WO 93016559-01, and thought that the IAE personnel would be going to the job site along with the MM personnel to perform this work. The ASST then signed the WO granting clearance to begin work with an understanding in his mind that the isolation of the RV, and the red tag that was required, would be placed by the IAE Technician (Tech) upon arrival at the job site. Since WO 93016559-01 was not on the IAE

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shift schedule for March 22, and IAE personnel were never notified of the need for a red tag, the required isolation and tagging never occurred.

Mechanical Maintenance personnel arrived at the job site, along with an RP Specialist (RPS). They found the upper anchor bolt, which holds the instrument tray to the wall, completely pulled from the wall. The anchor was still attached to the base plate, the top of which was hanging out from the wall approximately 2 inches. The MM personnel decided to see if they could drill an oversized hole in the concrete wall and reattach the support using a larger anchor bolt. The RPS stepped down to the floor level to allow the MM personnel room to work. The MM personnel removed the anchor bolt from the base plate. The MM personnel then attempted to align the hole drilled in the base plate with the existing hole in the wall by lifting the free end of the instrument tray. When the instrument tray was lifted, at 1450, the fitting on the horizontal section of tubing separated, with the fitting nut remaining on the fitting body. This created a leak from the NV charging header. Due to the pressure on this section of piping (approximately 2500 pounds per square inch) a leak of approximately 80 GPM occurred. The RPS directed the MM personnel to exit the pipechase. The RPS then went to the door and had the MM Tech, who was acting as a runner for the MM, call the CR and report the leak to the CR Operators.

When the leak started, the CR personnel received annunciator [EIIS:IB] alarms indicative of a problem on the charging header. Control Room indications showed that an NC system leak was in progress. Control Room personnel implemented procedure AP/2/A/5500/10, NC System Leakage Within The Capabilities Of The NV Pump, Case 1 NC System Leakage. CR personnel started an additional NV pump, which constitutes a manual ECCS actuation, in accordance with the procedure. At the same time, the RO received a phone call reporting the leak on the NV charging header. The CR personnel requested the MM Tech to isolate the leak if possible. The MM Tech passed this request to the RPS who was out of the pipechase area, but still within the boundary of the Radiation Control Zone. The RPS reentered the pipechase closed the RV and the instrument isolation valve, which are in series, and at 1503 was able to reduce the leak rate to approximately 1.5 GPM. The CR personnel stabilized the plant and exited from the abnormal procedure. Work Order, 93016559-01 for repair of the same fitting, was upgraded to emergency priority. IAE personnel entered the Auxiliary Building pipechase to repair the fitting at 1550, on March 22, 1993. The IAE personnel completed the repair of the instrument tubing, making no attempt to recover the failed components, and placed 2MNVLP-5620 back in service at 1910, on March 22, 1993.

On March 23, 1993, at 1610, a notification was made to the NRC in accordance with procedure RP/0/A/5700/10, NRC Immediate Notification Requirements.

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Conclusion

This event is assigned a cause of Construction/Installation Deficiency due to the fitting not having been made up properly when it was originally installed. Proper swaging of the tubing associated with this event was not accomplished and the fitting failed.

When asked if the fitting had been properly swaged, the IAE technician who repaired the fitting stated that it could not have been, since he did not need to cut the tubing. Had the tubing been swaged, the deformation would prevent a new ferrule from being placed on the tubing. An Operations Non Licensed Operator (NLO) was dispatched to the leak during the event to assist in isolating the leak. During an interview, this NLO reported the condition of the tubing to be without any sign of ever having been part of a compression fitting. The Subject Matter Expert (SME), from Component Engineering, when contacted felt that due to the indications that were reported by the IAE and Operations personnel that the fitting could not have been made up properly. He also stated that the most likely failure mechanism was that the end of the tubing was aligned with the narrow end of the ferrule. This alignment, which does not allow the end of the tubing to be fully seated into the fitting body, will not allow the joint to be properly swaged. Even though this fitting was not properly swaged, it did hold for quite a few years. In the opinion of the SME it would not be unusual for a joint made in this manner to hold for quite some time, but that the joint would not be as strong as if it had been done properly. The ferrule would compress on the end of the tubing to create a seal.

This event is also assigned a cause of Possible Inappropriate Action due to the damage to the instrument hanger. This hanger has apparently been used by station personnel to aid in maneuvering in the pipechase. Personnel, by hanging and climbing on this hanger, could have weakened the fitting joint which was already of less than optimum strength.

The third cause of this event is Management/Quality Assurance deficiency. This is due to the breakdown in the work control process resulting from a lack of clear direction, or procedures outlining the handling of WOs. The two WOs involved in the repair of this joint should have been worked at the same time. The task description, which stated that the WOs should be worked together, was not followed. This task description could not be followed unless the WOs were scheduled for the same day. Both WOs were scheduled for March 12, 1993, but they were returned to WC without any work being performed. From that time they were not again scheduled for the same day.

Work order 93003839 was planned in two tasks. The first did not require safety tags to be used on the RV. This would be normal for this job since the personnel who would perform the job, IAE, would be the same as the ones who would perform the isolation. However, the second task did require isolation and red tags from the IAE department. This was not recognized by the MM Supervisor, or by the MM crew who attempted to perform the work. The MM Supervisor,

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stated that he did not recognize that the letter I in the determination section of the WO was a designator for IAE red tags. The MM crews expect to see the letter Y if tags are required, or the letter N if not. Their training on and familiarity with the Work Management System has led them to believe that any WO which requires tags would have the letter Y. The MM Supervisor and several Senior Reactor Operators (SRO) were questioned and did not know that any other letters could be placed in the determination space except Y or N.

There is no MMP at this time that provides guidance of how the Work Management System (WMS) is supposed to designate the need for safety tags. When asked, the Manager of the Planning and Scheduling section of WC stated that there is a management procedure under development for WMS. Use of the WMS at McGuire began June 15, 1992. There are MMPs in place for the older method of work request handling, and these are applied to the present system as much as possible. The MMP 2.0, section 1.5 states, in part, that "IF red tagging is required prior to maintenance, the work request will be routed to the operational control group." MMP 2.0 further states that "The operational control group will tag, isolate and drain the component for maintenance to be performed." There is a reference in this section that mentions "The operational control group as outlined in MMP 1.5." MMP 1.5 does not provide an outline of the different operational control groups; however, instrument lines, their fittings, and their RVs are under the operational control of the IAE department. When asked, the IAE Shift Supervisor who was on duty at the time the leak occurred, stated that for his shift personnel to isolate and place tags, he would expect that the WO would come to him as the first step in the work execution process.

The required four hour notification to the NRC was made on the following day due to the failure of plant personnel to recognize that starting the NV pump is considered an ECCS actuation.

A search of the OEP database for the preceding 24 months found no other events where a manual actuation of ECCS occurred, or that were the result of an Installation Deficiency. This event is considered not recurring. This event is not NPRDS reportable.

There were no personnel injuries or radiation overexposures as a result of this event.

CORRECTIVE ACTIONS:

- Immediate: 1) Control Room personnel implemented AP/2/A/5500/10 NC System Leakage Within The Capabilities Of The Charging Pump to respond to the transient and stabilize the plant.
- 2) Work Order 93016559-01 was changed to emergency priority. IAE personnel,

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working under this WO, repaired the failed compression fitting.

- 3) The Shift Manager initiated problem investigation 2-M93-0242.

Subsequent: A working group of Station Management personnel assembled to define and identify a method to determine if this failure represents a generic station problem with compression fittings.

- Planned:**
- 1) Work Control personnel will meet with Engineering personnel, and determine the feasibility of reinforcing this instrument hanger, or relocating this hanger.
 - 2) Community Relations personnel will determine best method of increasing the awareness of site personnel about the use of instrumentation hangers for climbing.
 - 3) Work Control personnel will research the feasibility of allowing for a better defined Red Tag determination field on WOs.
 - 4) A revision to MMP will be made. This revision will require that any time IAE Red Tags are required for work that is to be performed by another group, a separate work task will be written to accomplish the isolation and tagging.
 - 5) A revision to MMP 2.2 will be made. This revision will require that any WO which must be coordinated with another WO will have the required coordination stated in the task description field of all necessary WOs.
 - 6) Operations and Safety Assurance personnel will revise plant Response Procedures, and create a decision aid, as necessary to increase the ability of CR personnel in making reportability determinations.
 - 7) Safety Assurance personnel will supply information concerning compression fitting failures as determined by the Management group referenced in the above Subsequent Action.

SAFETY ANALYSIS:

The NV system provides water to the NC system during normal and emergency operations. The ECCS function of the NV system, as described in chapter 6 of the FSAR is to provide a high

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head source of water to the NC System during accident conditions. Chapter 15 of the FSAR describes a LOCA which requires the use of the NV pumps in their ECCS capacity.

The leakage of 80 GPM from the discharge side of the NV pumps would effectively limit the amount of flow that the NV pumps could provide. However, the need of a high head source of water only occurs as a result of a small break. The acceptance criteria for the ECCS system, which is also found in chapter 15 of the FSAR, describes the required ECCS performance during accident conditions. In all cases, small break accidents yield a larger margin to the ECCS acceptance criteria than a large break accident. Without the high head capability, the effect of a small break LOCA would be to allow the NC system pressure to reach a lower value prior to reaching equilibrium. Equilibrium is reached when the mass being removed from the NC system via break flow, is equal to the mass which is being added to the NC system via ECCS flow. If the pressure of the NC system were to reach 1500 pounds per square inch, the Safety Injection (NI) pumps would begin to inject water into the NC system with a net affect that equilibrium would still be reached, but at a lower value.

The transient which occurred as a result of this event caused the level in the Pressurizer (PZR) to decrease indicating a loss of mass from the NC system. As the level in the PZR decreased, the CR personnel implemented the procedure AP/2/A/5500/10 which is designed to address transients of this nature. The CR personnel started an additional NV pump in accordance with the procedure. This action stopped the level decrease of PZR level, effectively terminating the transient to the NC system. The next action, required by procedure would have been to isolate L/D flow.

After the RV was closed, the PZR level began to increase, toward its normal value. When level had returned to normal, the CR operators stabilized the plant, and exited from the procedure. Had the CR personnel not been able to stop the level decrease in the PZR, level would have continued to fall until it reached 17 percent. At that value, an automatic isolation of the L/D flowpath would have occurred, which would have caused PZR level to increase.

There were two personnel contaminations as a result of this event. These contamination events occurred at the time of the initial failure due to the spray of water from the failed fitting. None of these events resulted in contamination levels of greater than 600 counts per minute, as measured by a frisker. The personnel who were contaminated were examined with a body burden analysis. No abnormal conditions were found. As a result of this event, the effluent radiation monitoring system saw a minor increase in the activity levels in the Unit Vent [EIIIS:VI]. These increased activity levels were well below any established administrative limits, and indicated no significant radioactive release.

The health and safety of the public were not effected by this event.