



Kewaunee Nuclear Power Plant
N490, State Highway 42
Kewaunee, WI 54216-9511
920-388-2560

Operated by
Nuclear Management Company, LLC



April 23, 2001

10CFR 50.73

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

Ladies/Gentlemen:

DOCKET 50-305
OPERATING LICENSE DPR-43
KEWAUNEE NUCLEAR POWER PLANT
REPORTABLE OCCURRENCE 2001-003-00

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System," the attached Licensee Event Report (LER) for reportable occurrence 2001-003-00 is being submitted. This report contains no new commitments.

Sincerely,

Kyle A. Hoops
Manager-Kewaunee Plant

GIH

Attach.

cc - INPO Records Center
US NRC Senior Resident Inspector
US NRC, Region III

IE22

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

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05000305

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TITLE (4)

Single Barrier Appendix R Doors Installed Improperly – The Closure Actuation System Did Not Conform to Code

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	21	2001	2001	B 003 B 00		04	23	2001	FACILITY NAME	DOCKET NUMBER
										05000
										05000
OPERATING MODE (9)		N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)							
POWER LEVEL (10)		097	20.2201(b)			20.2203(a)(3)(ii)		X	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)	50.73(a)(2)(x)
			20.2203(a)(1)			50.36(c)(1)(i)(A)			50.73(a)(2)(iv)(A)	73.71(a)(4)
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)	73.71(a)(5)
			20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)	OTHER
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)	
			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			50.73(a)(2)(vii)	
			20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)	
			20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)	

LICENSEE CONTACT FOR THIS LER (12)

NAME

Rick Liebmann – Mechanical Maintenance Engineer

TELEPHONE NUMBER (Include Area Code)

(920) 388-8518

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).

X

NO

EXPECTED SUBMISSION DATE (15)

MONTH

DAY

YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On February 21, 2001, with the reactor at 97% power, plant engineering staff discovered that two Appendix R single barrier doors had their actuation equipment installed improperly. As a result, the doors would not operate according to design and National Fire Protection Association (NFPA) 80, the standards for fire doors and fire windows. The doors are designed to close when any one of three fusible links melt. As installed, one of the three, fusible links would not have caused the door to close, due to improper actuation chain routing. Additionally, no fusible links were installed at the ceiling as required by the Code. Consequently, the doors may not have fulfilled their intended design function to separate dedicated equipment from alternate equipment in the event of an Appendix R design basis fire. The doors were installed in the fall of 1984. It is likely that the condition existed since their installation.

The doors were installed incorrectly due to a lack of detailed installation instructions and a lack of familiarity with the code requirements. Corrective actions were to keep the doors closed to remove any reliance on the automatic closure design. A fire hazards review of the vulnerability of the doors failing to close revealed a likely minimal impact. The effects of a small volume oil fire, the hazard of concern, revealed the impact would at most only cause a loss of one of two available service water pumps needed to meet Appendix R requirements.

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

DESCRIPTION OF EVENT

On February 21, 2001, with the reactor at 97% power, plant engineering staff discovered that two Appendix R single barrier doors [DR] had their actuation equipment installed improperly. As a result, the doors would not operate according to design and National Fire Protection Association (NFPA) 80, the standards for fire doors and fire windows. The doors are designed to close when any one of three fusible links melt. As installed, one of the three, fusible links would not have caused the door to close, due to improper actuation chain routing. Consequently, the doors may not have fulfilled their intended design function to separate dedicated equipment from alternate equipment in the event of an Appendix R design basis fire. The doors were installed in the fall of 1984. It is likely that the condition found existed since their installation.

According to NFPA 80, "Fire Doors and Fire Windows," Section 6, "Installation of Rolling Steel Doors," Section 6-6, "Automatic Fire Detectors," 6-6.1, "Detectors or fusible links shall be installed on both sides of the wall and interconnected so that the operation of any single detector or fusible link shall cause the door to close." The two affected doors, #279 and #281, had their automatic trip chain systems installed in a manner that resulted in a situation where the doors would not have closed if one specific fusible link, on each door, had melted.

Although the actuator designs between the roll-up style doors differ slightly, the problem identified in this event is the same for both doors. The door actuators are both designed so spring tension holds the doors open until any one of three fusible links melt. Melting the links releases tension on three interconnected lengths of chain that unlatch a lever at either end of the door actuator. When the levers are unlatched, a portion of the spring tension is released and the door falls closed. The actuator controls the door's closing speed when both levers are unlatched. Unlatching one of the two levers, releases the spring tension to allow the door to free-fall closed. The other lever being released engages a governor [65] mechanism that applies a force to control the rate of closure. Releasing only the governor lever will not cause the door to close.

The three lengths of chain are connected in series with three fusible links. Two of the links are located on one side of the wall with each link located towards opposite ends of the door. The center length of chain, the longest, is passed through a conduit [CND] (pipe) through the wall to a third fusible link release point. The conduit is located between the ends and above the actuator of the door. One end of the third fusible link is anchored solidly on the opposite side of the wall. The design of this system is such that the third link should be attached at its free end to the chain by a 'ringed' connection. This is necessary to allow the chain to move freely through the ring and conduit when the third link remains intact if a fire occurs on the other side of the wall. Freedom of movement is necessary to assure that all segments of the chain relax enough to unlatch the actuator. Given the as-found condition, if the link closest to the governor lever noted above were the only one to melt, the door would not close until one of the other links in the system was melted.

The condition discovered was that for both doors, the way the tripping chain was connected to the

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single fusible link, only two of the three fusible links in the system would have caused the door to close. The problem was a result of the diameter of the attachment point (ringed connection) through which the trip chain was routed. The attachment was a standard "S" hook of about 3/32 inch diameter wire. The chain links folded around the "S" hook at an extreme angle, approximately 90 degrees. Because of the relatively sharp angle, when a fuse link melted, creating slack in the chain on one side of the "S" hook, there was not enough force available from the light weight of the chain to cause the chain to move through the "S" hook. Consequently, when a specific link melted, the chain would not go slack and release the door actuator.

During 1984, roll-up fire doors 279 and 281 were installed per Design Change Request (DCR). A review of the DCR work package did not reveal any record of initial testing, though the vendor manual does contain installation steps that require dropping the door and making adjustments as needed to ensure it closes properly. The doors were inspected on October 30, 1985 and October 27, 1986 per Technical Support Procedure (TSP) 08-2, "Semi-Annual Inspection of Fire Doors." Procedure records indicate the procedure results being satisfactory with no comments recorded. Since there were no comments in the records, it is unclear whether the inspection included a detailed inspection of the actuator chain routing or whether a functional test was performed.

In 1987, drop tests were performed on the doors at the request of a Nuclear Regulatory Commission (NRC) inspector who was on site for an Appendix R inspection. The text of the related inspection report (Report No. 50-305/87013(DRS), dated 6/10/1987) recorded a satisfactory functional test of both doors. The extent of the functional tests, other than signifying a fusible link was removed, is not specific. This test was the first recorded test of the doors that was recorded as a functional test. However, since it does not signify whether each fusible link was tested, and it does not indicate that there were any concerns with how the trip linkage may have been installed, it is not clear that the condition being reported also existed then.

Similarly, in 1993, a work order was used in conjunction with the preventive maintenance procedure to ensure doors 279 and 281 were tested by removing a fusible link to trip the doors. Again, the documentation available does not indicate that each fusible link was removed, and does not indicate that there were any concerns with how the trip linkage was installed.

The test of the door's ability to close in 1993 is the last documented functional test of a roll-up door until the most recent test on January 12, 2001. Although a number of inspections and tests were performed which referred to both doors, the scope of the tests is inconclusive. The procedures used to conduct any tests lacked details as to what was tested. Additionally, the scope of any inspections that may have been performed is also unclear. There is no documentation to support whether the fusible links and/or chain orientation was examined or tested.

Failure to include the doors in a periodic test program to ensure functionality is the subject of an earlier Licensing Event Report (refer to LER 2001-001). There was also an opportunity to recognize the installation error at that time. However, the extent of examination and testing of the

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actuators was not as extensive as it could have been.

In addition to the problem described above, it was also noted that the location of the fusible links in the actuator system did not conform to NFPA 80. NFPA 80, 6-6.2 requires fusible links to be located above the door opening and requires additional links to be located at or near the ceiling on either side of the wall. The fusible links for the doors discussed in this report did not conform to the ceiling location specified by the code. Although the links were located directly above the door openings and on either side of the wall, they were located several feet below the ceiling. No additional links were installed at or near the ceiling to meet 6-6.2 code requirements.

It does not appear that this second deviation from the code had been recognized previously. In 1987 an analysis of the door application was conducted. The purpose of the analysis was described, in part, as, "to analyze the use of fusible link held open roll-up doors." The analysis records make no reference to fusible links being required to be located at the ceiling. The subject record does describe briefly the logic and thought processes to conclude that the fusible links will actuate and close the doors as designed. However, the fire hazard considered during the review differs from the one that could result in only a single link melting that is the basis for this LER.

CAUSE OF THE EVENT

The fire doors were installed in the fall of 1984. The installation instructions provided by the manufacturer, Cornell Iron Works Inc., and the distributor, Wm. M. Heinz & Sons, provided several generic examples of how the trip chain was to be routed. The examples contained very little specific detail. The written instructions had enough information to understand the intended routing, but lacked details on the size of the hardware that was to be used. There was no indication of the inside diameter of the eyebolts to be used. There was no indication of the cross sectional diameter of the material used to form the eyebolts. There was no indication of a minimum length of the chain in any particular leg of the trip chain assembly. There was also no mention or indication of the required proximity to the ceiling.

The installation engineer did not specifically review NFPA 80 for detail information about rolling fire doors prior to starting the construction of the walls and the installation of the rolling fire doors. The carpenters who were constructing the walls had no specific knowledge of NFPA 80. The installation of the tripping chain assembly was based solely on step 14 on page ES10-209.1 and the typical fuse link arrangements on page ES 10-209.6 of the Cornell Iron Works Inc. Installation Instructions for Fire Doors.

The tripping chain assembly was installed using the easily accessible information that was on site. The installation engineer lacked the experience and the appreciation for the ramifications of not securing the applicable sections of the most current governing code. The assumption was that the information in hand had sufficient detail to effect an acceptable installation.

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The cause of this event is attributed to less than adequate instructions and personnel lacking experience in installing this type of equipment.

ANALYSIS OF THE EVENT

This report is being submitted in accordance with the requirements of 10CFR50.73(a)(2)(ii)(B), any event or condition that resulted in the nuclear power plant being in an unanalyzed condition. Failure to install the doors according to NFPA 80 requirements resulted in the doors' being in a non-conforming condition. Consequently, the plant's ability to meet Appendix R requirements to assure safe shutdown safety equipment separation could not be assured.

Roll up fire doors 279 and 281 separate the A train, dedicated, components (service water [BI] pumps [P], fire pumps, and traveling screens) from the B train, alternate, components. In the event of a fire, because the rolling fire doors may not have closed, the Appendix R train separation may not have occurred. The area does have detection [DET][28] and suppression. In all but the most extreme situations, these added features would have provided warning to initiate the backup response of the fire team.

From a review of the effects of the fire hazard the doors would have to protect against, the effects of damage would likely be minimal. By applying the fire induced vulnerability evaluations (FIVE) methodology to capture the effects of a small volume oil fire, the hazard of concern, the impact on opposite train equipment would most likely only cause a loss of one of two available SW pumps [P].

CORRECTIVE ACTIONS

The immediate compensatory action and the longer-term corrective action taken is to administratively maintain both door 279 and door 281 in a closed position. Additionally, by virtue of tripping the latching mechanism, a significant portion of the balancing spring force has been removed from the operating mechanism. The effect of this is that the doors can not be opened without tools, thus reinforcing the administrative (tagging) control of the doors. With the doors in this "tripped closed" configuration, the tripping chain assembly is not required to operate in order for the doors to perform their design function of maintaining a 3 hour fire boundary.

Corrective actions are being taken to create a barrier configuration control program. This program will contain controls to maintain these doors in a closed position and direction on how to properly open and re-close them. Therefore, in the future, when the rollup doors are opened to permit equipment and/or personnel passage, they will be controlled in accordance with the plant's degraded barrier control program. This program will assure that the Fire Plan compensatory actions are in place when the doors are open and will assure the necessary administrative controls.

No specific corrective actions are being proposed to address the lack of instructions and personnel experience. Since the doors were installed there have been a number of changes in the way

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modifications are installed compared to 15 year ago where this event likely occurred. The sensitivity to what should be considered when making changes to fire protection related equipment as well as the availability of fire protection expertise on site has improved. Reference to the NFPA standards has also been expanded in later versions of the Kewaunee Fire Protection Program Plan.

ADDITIONAL INFORMATION

This event is considered a Safety System Functional Failure (SSFF) as defined in NEI 99-02.

SIMILAR EVENTS

Refer to LER 2001-001-00, Single Barrier Appendix R Fire Door Failed To Close – Door Had Not Been Part of a Periodic Test Program, 02/20/2001.