

June 27, 2006

MEMORANDUM TO: Michael Case, Director
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

FROM: Mary Jane Ross-Lee, Chief /RA/
Operating Experience Branch
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

SUBJECT: ISSUANCE OF QUARTERLY SUBMITTAL TO INCIDENT
REPORTING SYSTEM VIA WEB-BASED SYSTEM

The purpose of this memo is to inform you of the new web-based Incident Reporting System (IRS). The Nuclear Regulatory Commission (NRC) was notified by e-mail on April 27, 2006 that the International Atomic Energy Agency (IAEA) had transferred the IRS to the web, and all reports should be posted and retrieved from the IRS website. Previously, the Operating Experience Branch (IOEB) would submit the recent NRC generic communications by e-mail and hard copy for inclusion in the IRS. The NRC will now begin submitting these reports to the IRS over the web once they have been approved and posted in ADAMS. This new process will enhance the IRS by streamlining the process for submitting IRS reports and improving the timeliness of the submittals. The following operating experience reports from United States reactors are enclosed:

NRC Information Notice 2006-04: Design Deficiency in Pressurizer Heaters for Pressurized-Water Reactors

NRC Information Notice 2006-05: Possible Defect in Bussmann KWN-R AND KTN-R Fuses

NRC Information Notice 2006-06: Loss of Offsite Power and Station Blackout Are More Probable During Summer Period

Each report and related coding will be submitted to the IRS via the internet at <http://irs.iaea.org>.

Enclosures:
As stated

CONTACT: Brett A. Rini, NRR/DIRS
301-415-3931

June 27, 2006

MEMORANDUM TO: Michael Case, Director
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

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NRC Information Notice 2006-04: Design Deficiency in Pressurizer Heaters for Pressurized-Water Reactors

NRC Information Notice 2006-05: Possible Defect in Bussmann KWN-R AND KTN-R Fuses

NRC Information Notice 2006-06: Loss of Offsite Power and Station Blackout Are More Probable During Summer Period

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ADAMS ACCESSION NUMBER: ML061780488

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DATE	06/27/2006	06/27/2006	06/27/2006

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INCIDENT REPORTING SYSTEM

IRS NO.	EVENT DATE	N/A	DATE RECEIVED
EVENT TITLE			
NRC Information Notice 2006-04: Design Deficiency in Pressurizer Heaters for Pressurized-Water Reactors			
COUNTRY	PLANT AND UNIT	REACTOR TYPE	
United States	Generic	PWR	
INITIAL STATUS	RATED POWER (MWe NET)		
N/A	N/A		
DESIGNER	1st COMMERCIAL OPERATION		
N/A	N/A		

ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about pressurizer heaters that failed following replacement because the heater elements provided by the vendor did not match the licensees' design specification. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

NRC INFORMATION NOTICE 2006-04

Please refer to the dictionary of codes corresponding to each of the sections below and to the coding guidelines manual.

1. **Reporting Categories:**
 - 1.2.6
 - 1.4

2. **Plant Status Prior to the Event:**
 - 2.0

3. **Failed/Affected Systems:**
 - 3.AF

4. **Failed/Affected Components:**
 - 4.2.4

5. **Cause of the Event:**
 - 5.1.2.2
 - 5.1.2.6
 - 5.7.2

6. **Effects on Operation:**
 - 6.2

7. **Characteristics of the Incident:**
 - 7.0

8. **Nature of Failure or Error:**
 - 8.2

9. **Nature of Recovery Actions:**
 - 9.1

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

February 13, 2006

NRC INFORMATION NOTICE 2006-04: DESIGN DEFICIENCY IN PRESSURIZER
HEATERS FOR PRESSURIZED-WATER
REACTORS

ADDRESSEES

All holders of operating licenses for pressurized-water reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about pressurizer heaters that failed following replacement because the heater elements provided by the vendor did not match the licensees' design specification. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

During the Fall 2004 refueling outage, the licensee at Palo Verde Generating Station, Unit 3, replaced all 36 pressurizer heaters with replacements supplied by Framatome that had heater internals manufactured by Thermocoax. From December 2004 through February 2005, four of the replaced heaters in the proportional heater banks failed. On May 23, 2005, with Palo Verde Unit 3 in Mode 5 (cold shutdown), the licensee replaced nine Framatome/Thermocoax heaters with General Electric (GE) heaters. During the subsequent reactor heatup, five Framatome/Thermocoax heaters in the backup heater banks failed. As a result of the continued heater failures, the licensee returned to Mode 5 to replace all remaining Framatome/Thermocoax pressurizer heaters with GE heaters. When the Framatome/Thermocoax heaters failed, all were grounded, and all but one tripped a circuit breaker to clear a ground fault. The licensee discovered one heater grounded while maintenance was being performed during the outage. There was no damage to any other equipment such as power cables as a result of the heater failures.

During the Spring 2005 refueling outage, Waterford Steam Electric Station, Unit 3, replaced 29 pressurizer heaters with replacements supplied by Framatome that had the heater internals manufactured by Thermocoax. During plant heatup but prior to reactor startup, two of the replaced heaters experienced partial ejection of the epoxy in the receptacle area due to heat

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transfer to electrical connections in the receptacle area, six experienced failure due to grounding, and several experienced partial melting of the silicon-type material used to seal the bottom end of the receptacles. The licensee replaced 23 Framatome/Thermocoax heaters with Watlow heaters and abandoned the remaining 6 Framatome/Thermocoax heaters in place by electrically disconnecting them. There was no damage to any other equipment such as power cables as a result of the heater failures.

The vendor subsequently inspected the failed heaters from the Palo Verde and Waterford plants and determined that the heaters had been incorrectly fabricated with a longer heating element than the licensees' design specification. The longer heating elements extended down into the heater sleeves and pressurizer shell thereby changing the location of the transition joint that separates the heated and unheated portion of the heater assembly. This resulted in a reduced ability to transfer that heat away from the heater and also allowed more heat transfer to electrical connections in the receptacle area.

DISCUSSION

Technical specifications for PWRs specify a minimum required available capacity of pressurizer heaters to ensure that the RCS pressure can be controlled to maintain subcooled conditions in the RCS. Plant operation with failed pressurizer heaters can affect a facility's ability to control reactor pressure. Following a reactor trip, unnecessary safety injection actuations could occur due to inability to maintain RCS system pressure above the actuation set point.

Additionally, the longer heating elements extended down into the heater sleeves and pressurizer shell resulted the potential to exceed the allowable temperature limits by the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code*.

The Palo Verde and Waterford licensees had each supplied Framatome the correct design specification regarding the location of the transition joint between the heated and unheated portions of the heater assembly. However, Framatome supplied pressurizer heater assemblies that did not match the design specification. The licensees did not obtain vendor specifications and drawings that were sufficiently detailed to allow them to identify that the replacement pressurizer heaters were not consistent with the licensees' design specification.

At Palo Verde Generating Station, Unit 3, one heater was discovered grounded while maintenance was being performed during the outage. Sensitive ground-fault protection on low voltage circuits such as 480 V pressurizer heater circuits, can help in the detection of a ground fault.

Additional information on this subject is available in a Title 10 of the *Code of Federal Regulations* Part 21 (10 CFR Part 21) report from Framatome dated July 28, 2005, which is accessible using NRC's document control system (Agencywide Documents Access and Management System (ADAMS), Accession No. ML052140277).

CONTACTS

This information notice requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

/RA/

Christopher I. Grimes, Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.

INCIDENT REPORTING SYSTEM

IRS NO.	EVENT DATE	N/A	DATE RECEIVED
EVENT TITLE			
NRC Information Notice 2006-05: Possible Defect in Bussmann KWN-R AND KTN-R Fuses			
COUNTRY		PLANT AND UNIT	REACTOR TYPE
United States		Many	N/A
INITIAL STATUS		RATED POWER (MWe NET)	
N/A		N/A	
DESIGNER		1st COMMERCIAL OPERATION	
N/A		N/A	

ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees of a possible defect in Bussmann KWN-R and KTN-R fuses. Recipients are expected to review the information for applicability to their facilities and consider actions to avoid similar problems. However, the suggestions in this information notice are not NRC requirements; therefore, no specific action or written response is required.

NRC INFORMATION NOTICE 2006-05

Please refer to the dictionary of codes corresponding to each of the sections below and to the coding guidelines manual.

1. **Reporting Categories:**
 - 1.3.4
 - 1.4

2. **Plant Status Prior to the Event:**
 - 2.0

3. **Failed/Affected Systems:**
 - 3.E

4. **Failed/Affected Components:**
 - 4.3.2

5. **Cause of the Event:**
 - 5.1.2.4
 - 5.5.2
 - 5.7.2

6. **Effects on Operation:**
 - 6.0

7. **Characteristics of the Incident:**
 - 7.0

8. **Nature of Failure or Error:**
 - 8.2

9. **Nature of Recovery Actions:**
 - 9.0

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

March 3, 2006

NRC INFORMATION NOTICE 2006-05: POSSIBLE DEFECT IN BUSSMANN KWN-R AND
KTN-R FUSES

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees of a possible defect in Bussmann KWN-R and KTN-R fuses. Recipients are expected to review the information for applicability to their facilities and consider actions to avoid similar problems. However, the suggestions in this information notice are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

A customer of Wyle Laboratories reported that a KWN-R fuse lost its electrical continuity while in service. The customer cut the fuse open and found the fuse element intact and a lack of electrical continuity across the soldered connection of the element to the rejection ferrule of the fuse. According to the customer, the fuse had been in service from March 31, 2005 to August 4, 2005, carrying 2 to 3 amperes, and there had been no overcurrent events to cause the fuse to open. The customer returned the fuse to Wyle for failure analysis. Wyle forwarded the fuse to Bussmann (the fuse manufacturer) for evaluation. Bussmann found a poor solder connection on the rejection cap. Apparently the cap did not get hot enough to reflow solder during the manufacturing process. Bussmann stated that the issue might extend to other fuses due to a manufacturing process problem.

Wyle Laboratories indicated to the NRC that the only two nuclear power plants that purchased the susceptible KWN-R fuses from Wyle are Hatch Electric Generating Plant and Pilgrim Nuclear Power Station. Wyle has contacted the two customers that have purchased KWN-R fuses from Wyle Laboratories. Since these fuses might have been sold to other nuclear power plants by different vendors, this problem may be generic. Some nuclear power plants have contacted Bussmann and Wyle with inquiries since a Part 21 report was posted on the NRC Web-site.

DISCUSSION

The only KWN-R fuses affected are fuses rated less than or equal to 30 amperes. To date, poor solder joints have been found in 3, 6, and 10 ampere KWN-R fuses with date codes L05, M37, and M17. Poor solder connections have also been found in fuses with date codes

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L11, L19, M07, M20, and M40. KTN-R fuses with ratings less than or equal to 30 amperes were later added to the potentially defective fuse list since these fuses are manufactured using the same process as the KWN-R fuses. Poor solder connections have been found in 3, 4, 5, and 15 amperes KTN-R fuses of 1987-1991 vintage (there are no date codes on these fuses).

On one KWN-R-10 fuse that was in service, Bussmann found no solder connection on the rejection cap. It appeared the cap did not get hot enough to reflow the solder to the tab on the element. There were no signs of solder on the connecting tab of the bridge/element assembly. The lack of solder and corrosion in the cap caused an open circuit condition. Bussmann identified that the manufacturer's personnel have failed to follow process instruction. They are supposed to pull on the bridge assembly of every fuse to determine that a junction has been obtained between the bridge tab and cap. The design of the bridge and cap attachment is common to the KWN-R and KTN-R fuses rated at 1 through 30 amperes.

Bussmann has taken corrective actions to prevent the potential defect in these fuses. It has added a mechanical test to the KWN-R and KTN-R manufacturing process. The test consists of checking the resistance of each fuse and then mechanically impacting it and checking the resistance again. If the resistance readings differ, the fuse is segregated for disposition. The mechanical impact is produced by dropping the fuse at least 3 feet (93 centimeter) onto the plain cap end through a tube with an internal diameter of about 5/8 inch (1.6 centimeters). Bussmann also tests each production lot at 110 percent of the rated current for the KWN-R product.

As a screening test to ensure a good solder connection, the manufacturer recommends performing a current-carrying test for 30 minutes at 110 percent of the rated current after warm up at 100 percent of the rated current. This will avoid blowing the fuse. When performing the mechanical impact test, if the resistance readings differ by more than +/- 10 percent or fall outside the manufacturers' specifications, the fuse should be rejected. Only KWN-R and KTN-R fuses that pass the mechanical impact test and the 110 percent current-carrying capacity test are qualified.

CONTACT

This information notice requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

/RA/

Christopher I. Grimes, Director
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Office of Nuclear Reactor Regulation

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INCIDENT REPORTING SYSTEM

IRS NO.	EVENT DATE	N/A	DATE RECEIVED
EVENT TITLE			
NRC Information Notice 2006-06: Loss of Offsite Power and Station Blackout Are More Probable During Summer Period			
COUNTRY	PLANT AND UNIT	REACTOR TYPE	
United States	Generic	N/A	
INITIAL STATUS	RATED POWER (MWe NET)		
N/A	N/A		
DESIGNER	1st COMMERCIAL OPERATION		
N/A	N/A		

ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about the recent Office of Nuclear Regulatory Research (RES) study that confirmed an increased frequency of loss-of-offsite power (LOOP) and station blackout (SBO) events during the summer period (i.e., May through September). Recipients are expected to review the information for applicability to their facilities and consider appropriate actions to address similar problems. However, suggestions contained in this information notice are not NRC requirements and no specific action or written response is required.

NRC INFORMATION NOTICE 2006-06

Please refer to the dictionary of codes corresponding to each of the sections below and to the coding guidelines manual.

1. **Reporting Categories:**
1.4
1.7
2. **Plant Status Prior to the Event:**
2.0
3. **Failed/Affected Systems:**
3.EA
4. **Failed/Affected Components:**
4.3.1
5. **Cause of the Event:**
5.1.2
5.1.7.3
6. **Effects on Operation:**
6.1
7. **Characteristics of the Incident:**
7.9
8. **Nature of Failure or Error:**
8.0
9. **Nature of Recovery Actions:**
9.0

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

March 3, 2006

NRC INFORMATION NOTICE 2006-06: LOSS OF OFFSITE POWER AND STATION
BLACKOUT ARE MORE PROBABLE DURING
SUMMER PERIOD

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about the recent Office of Nuclear Regulatory Research (RES) study that confirmed an increased frequency of loss-of-offsite power (LOOP) and station blackout (SBO) events during the summer period (i.e., May through September). Recipients are expected to review the information for applicability to their facilities and consider appropriate actions to address similar problems. However, suggestions contained in this information notice are not NRC requirements and no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

NUREG-1784, "Operating Experience Assessment - Effects of Grid Events on Nuclear Power Plant Performance," dated December 2003 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML033530400), showed that switchyard and grid-related LOOP events occurred mostly during the summer months.

A new report on RES-sponsored work by the Idaho National Laboratory entitled NUREG/CR-6890, "Re-evaluation of Station Blackout Risk at Nuclear Power Plants," was published in December 2005 (ADAMS Accession Nos. ML060200477, ML060200479, and ML060200510). The new report confirmed the earlier observations and showed the following seasonal risk insights:

- The SBO risk increased by a factor of two during the summer period between 1997 and 2004 because 22 summer and 2 non-summer LOOP events occurred during this period.
- The overall LOOP frequency is more than twice as high during the summer period when compared to the annual average.

- The probability of LOOP after a reactor trip is greater during the summer period.
- All four categories of LOOP (plant, switchyard, grid, and weather-centered events) had higher frequencies during the summer period.

DISCUSSION

An insight from the new study is that plant-specific LOOP frequencies can change significantly with seasonal conditions. The changes in the probability of a LOOP or an SBO by season can affect assumptions used in plant-specific risk assessments (either quantitative or qualitative) required by Title 10 of the Code of Federal Regulations, Section 50.65, the Maintenance Rule. The risk assessments for individual plants in different regions of the country and at different times of the year could also be affected based on regional uniqueness resulting from seasonal generating and transmission limitations.

CONTACT

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/RA/

Christopher I. Grimes, Director
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Office of Nuclear Reactor Regulation

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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.