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

April 7, 1988

NRC INFORMATION NOTICE NO. 88-11: POTENTIAL LOSS OF MOTOR CONTROL CENTER AND/OR SWITCHBOARD FUNCTION DUE TO FAULTY TIE BOLTS

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is being provided to alert addressees to the potential for failure of bolts used to splice bus bars in motor control centers and switchboards. If these bolts should fail, a loss of electrical function is possible. The event described highlights the importance of inspecting motor control centers and switchboards. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to preclude similar problems from occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

During a recent inspection of motor control centers and switchboards, classified as Class 1E as well as some not classified as 1E, at Brunswick Units 1 and 2, the licensee, Carolina Power and Light, found that numerous 5/16 inch silicon bronze carriage bolts connecting the bus bars had failed. These bolts are used to ensure electric connection and not structural integrity. The percentage of failed bolts approached 35 percent in some inspected equipment. In one case both bolts in a splice had failed and there was evidence of high-resistance-induced overheating.

Discussion:

In 1973, during bus bar installation, the licensee noted many failures of the bolts used to splice the bars and connect battery cables. The licensee discussed this problem with General Electric, and it was discovered that the 18 ft-lb torque identified on a drawing was incorrect. The correct value was 9 ft-lb. This drawing had been provided to the architect/engineer, United Engineers, and was used during construction in 1973. In addition, no lubricant was specified or used; however, had a lubricant been used, torquing to 9 ft-lb would have increased the bolting stress, which could also lead to bolt failure.

Although the licensee replaced all of the broken bolts at that time, it is not known if bolts that did not fail were replaced or merely retorqued. Records that might have provided this missing information were destroyed in a fire.

After 10 years of power production, the licensee instituted a program to inspect the internals of motor control centers and switchboards. This program had a rotating inspection schedule that allowed for 10 percent of the equipment to be inspected at each refueling outage. By 1986, approximately 40 percent of the equipment had been inspected. After finding one or two failed bolts in each inspected ac motor control center (approximately 4 percent failure rate), the licensee concluded that an accelerated inspection program was necessary. The accelerated inspection, which also involved the dc switchboards, revealed as many as 19 failed bolts out of 54 bolts in one of the dc switchboards, or a failure rate of about 35 percent. The dc switchboards were not part of the initial inspection because they are shared between both units and simultaneous outages were required to perform the inspection.

Even though the NRC staff believes that the incorrect torque values were used only at Brunswick, because of the potential consequences and similarities in electrical distribution systems, it is possible that similar equipment may have been improperly installed in other nuclear power plants. The consequences of such improper installation may include total station blackout during a seismic event or an electrical fire resulting from localized heating at a weakened splice. The existence of this problem can be determined by checking installation instructions, verifying torque values, and/or by visual examinations. Retorqueing of these bolts may not be adequate to ensure their continued service; replacement may be necessary.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.

Charles E. Rossi

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contact: Raymond F. Scholl, NRR
(301) 492-1171

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-10	Materials Licensees: Lack of Management Controls Over Licensed Programs	3/28/88	All NRC licensees authorized to use byproduct material.
87-44, Supp. 1	Thimble Tube Thinning in Westinghouse Reactors	3/28/88	All holders of OLs or CPs for nuclear power reactors that employ a Westinghouse NSSS.
88-09	Reduced Reliability of Steam-Driven Auxiliary Feedwater Pumps Caused by Instability of Woodward PG-PL Governors	3/18/88	All holders of OLs or CPs for nuclear power reactors.
88-08	Chemical Reactions with Radioactive Waste Solidification Agents	3/14/88	All NRC licensees generating or processing low level radioactive waste.
88-07	Inadvertent Transfer of Licensed Material to Uncontrolled Locations	3/7/88	All NRC broad licensees and licensees authorized to possess byproduct material as sealed sources in teletherapy units or "self-contained" irradiators.
88-06	Foreign Objects in Steam Generators	2/29/88	All holders of OLs or CPs for PWRs.
88-05	Fire in Annunciator Control Cabinets	2/11/88	All holders of OLs or CPs for nuclear power reactors.
88-04	Inadequate Qualification and Documentation of Fire Barrier Penetration Seals	2/5/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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*see previous concurrence

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RScholl:db	PBaranowsky	WLanning	AThomas	CYCheng	LShao	CHBerlinger
3/30/88	3/30/88	3/30/88	3/11/88	4/1/88	4/1/88	3/31/88

D:DOEA:NRR
CERossi
4/4/88

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After 10 years of power production, the licensee instituted a program to inspect the internals of motor control centers and switchboards. This program had a rotating inspection schedule that allowed for 10 percent of the equipment to be inspected at each refueling outage. By 1986, approximately 40 percent of the equipment had been inspected. After finding one or two failed bolts in each inspected ac motor control center (approximately 4 percent failure rate), the licensee concluded that an accelerated inspection program was necessary. The accelerated inspection, which also involved the dc switchboards, revealed as many as 19 failed bolts out of 54 bolts in one of the dc switchboards, or a failure rate of about 35 percent. The dc switchboards were not part of the initial inspection because they are shared between both units and simultaneous outages were required to perform the inspection.

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After 10 years of power production, the licensee instituted a program to inspect the internals of motor control centers and switchboards.

This program had a rotating inspection schedule that allowed for 10 percent of the equipment to be inspected at each refueling outage. By 1986, approximately 40 percent of the equipment had been inspected. After finding one or two failed bolts in each inspected ac motor control center (approximately 4 percent failure rate), the licensee concluded that an accelerated inspection program was necessary. The accelerated inspection, which also involved the dc switchboards, revealed as many as 19 failed bolts out of 54 bolts in one of the dc switchboards, or a failure rate of about 35 percent. The dc switchboards were not of the initial inspection because they are shared between both units and simultaneous outages were required to perform the inspection.

Even though the NRC staff believes that the incorrect torque values were used only at Brunswick, because of the potential consequences and similarities in electrical distribution systems, it is possible that similar equipment may have been improperly installed in other nuclear power plants. The consequences of such improper installation may include total station blackout during a seismic event or an electrical fire resulting from localized heating at a weakened splice. The existence of this problem can be determined by checking installation instructions, verifying torque values, and/or by visual examinations. Any bolts found to be improperly torqued or those bolts exhibiting evidence of mechanical failure should be replaced not retorqued.

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RF

DEST
L.Shao

At that time, the licensee replaced all of the broken bolts, but it is not known if bolts that did not fail were replaced or merely retorqued. Records which might have provided the missing information are not available due to a fire.

After 10 years of power production, the licensee instituted a program to inspect the internals of motor control centers and switchboards. This initial program had a rotating inspection schedule in which 10% of the equipment would be inspected at each refueling outage. By 1986, approximately 40% of the equipment had been inspected. After finding 1 or 2 failed bolts in each inspected ac motor control center (an approximate 4% failure rate), the licensee concluded that an accelerated inspection program was necessary. The accelerated inspection which also involved the dc switchboards revealed failure rates as high as 19 bolts out of 54 possible bolts or about 35%. The dc switchboards were not part of the initial inspection since they are shared between both units and simultaneous outages were required to perform the inspection.

Even though the NRC staff believes that the incorrect torque values were used only at Brunswick, because of the potential consequences and similarities in electrical distribution systems, it is possible that similar equipment may have been improperly installed in other nuclear power plants. The consequences of such improper installation may include total station blackout during a seismic event or an electrical fire due to localized heating at a weakened splice. Therefore, other licensees may conclude that it would be prudent for motor control centers and switchboards to be the subject of a prevent maintenance program that checks installation instructions, verifies torque values, and provides for visual examinations.

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