

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

December 13, 1993

NRC INFORMATION NOTICE 93-95: STORM-RELATED LOSS OF OFFSITE POWER EVENTS
DUE TO SALT BUILDUP ON SWITCHYARD INSULATORS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors located close to a large body of salt water.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the potential for loss of offsite power due to salt contamination of switchyard insulators. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, no specific action or written response is required.

Description of Circumstances

On March 17, 1993, the Florida Power Corporation Crystal River Unit 3 experienced a loss of the 230 kV switchyard (normal offsite power to safety-related busses) when a light rain caused arcing across salt-laden 230 kV insulators and opened breakers in the switchyard. At the time, the unit was in cold shutdown during a maintenance outage. The "A" emergency diesel generator was used to power safety-related loads including shutdown cooling until the 230 kV switchyard was restored. The "B" emergency diesel generator was unavailable due to maintenance. The 500 kV switchyard supplied nonvital loads throughout the event.

On March 16 through 18, 1993, Carolina Power and Light Company's Brunswick Units 1 and 2 experienced a loss of the 230 kV switchyards (all offsite power) when light rain caused arcing across salt-laden insulators and opened breakers in the switchyard. At the time, both units were in cold shutdown during an extended outage. Emergency diesel generators were used to power safety-related loads including shutdown cooling until the offsite power was restored.

Since 1982, the Boston Edison Company Pilgrim station has also experienced several loss of offsite power events when heavy ocean storms deposited salt on the 345 kV switchyard causing the insulators to arc to ground.

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updated on 12/13/93

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Discussion

Intense and unusual storms on March 13 and 14, 1993, produced high tides and high winds (average of 80 to 97 kilometers/hour high winds [50 to 60 miles/hour], with gusts up to 160 kilometers/hour [100 miles/hour] blowing ashore from the ocean i.e., Gulf of Mexico and Atlantic Ocean. These storms caused an unusual buildup of salt on the switchyard insulators at Crystal River Unit 3 and Brunswick Units 1 and 2. The storms were unusual in that they included high winds but little or no precipitation. As a result, salt from ocean spray built up on the switchyard insulators and was not washed away by rain.

Days later, light rain increased the electrical conductivity of the salt, resulting in arcing across the insulators at both sites. To remove the salt from the insulators, Florida Power Corporation and Carolina Power and Light Company deenergized the affected switchyards, washed the insulators with high pressure demineralized water, then returned the switchyards to service. The washing stopped the electrical arcing across the insulators.

The 500 kV switchyard for Crystal River Unit 3 is located adjacent to the 230 kV switchyard. It was relatively unaffected. The 500 kV switchyard is used for main generator output when Unit 3 is operating and is used for an alternate source of offsite power (i.e., backfeeding of nonvital loads) during Unit 3 outages. The 500 kV switchyard experienced less arcing across the insulators than the 230 kV switchyard and no tripped breakers. As a precautionary measure, the licensee also deenergized and washed the 500 kV switchyard insulators. Factors that may have reduced the storm impact on the 500 kV switchyard included location (farther away from the shore) and higher insulation level (the 500 kV insulators were designed for up to 700 kV operation while the 230 kV insulators were designed for up to 242 kV operation). In addition, the licensee observed that, of the two types of 230 kV insulators installed, the newer post type had less arcing than the older cap and pin type.

Licensee followup action in response to these events, to improve the future performance of non-safety switchyard equipment, included: investigating available salt buildup monitoring systems, evaluating insulator washing methods/capabilities, considering the use of room temperature vulcanized (RTV) silicon rubber coatings, installing newer metal oxide gapless surge arrestors to replace older silicon carbide gap type surge arrestors, and replacing cellon-treated wood transmission towers.

The 345 kV switchyard insulators at Pilgrim were coated with RTV silicon rubber (Sylgard) in 1987. It was expected that the RTV coating, when applied in 1987, would be effective for a period of 15 years. However, actual experience at Pilgrim indicates that the coating is effective for a much

shorter period of time. Consequently, the insulators at Pilgrim were cleaned and coated with RTV again during the spring 1993 refueling outage. As a long-term option, the licensee is considering a replacement of the existing 345 kV switchyard with a modern compactly designed switchyard which would be more resistant to the coastal environment.

These events illustrate the significance of maintaining reliable offsite and onsite power sources during outages as well as during operation.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Regulation (NRR) project manager.



Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: R. Schin, RII (404) 331-5561 P. Fillion, RII (404) 331-7288
P. Holmes-Ray, RII (904) 795-7677 P. Kang, NRR (301) 504-2779
R. Prevatte, RII (919) 457-9531

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List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-94	Unauthorized Forced Entry into the Protected Area at Three Mile Island Unit 1 on February 7, 1993	12/09/93	All holders of OLs or CPs for nuclear power reactors.
93-93	Inadequate Control of Reactor Coolant System Conditions During Shutdown	12/08/93	All holders of OLs or CPs for nuclear power reactors.
93-92	Plant Improvements to Mitigate Common Dependencies in Component Cooling Water Systems	12/07/93	All holders of OLs or CPs for nuclear power reactors.
91-21, Supp. 1	Inadequate Quality Assurance Program of Vendor Supplying Safety-Related Equipment	12/07/93	All holders of OLs or CPs for nuclear power reactors and all recipients of NUREG-0040, "License Contractor and Vendor Inspection Status Report" (White Book).
89-77, Supp. 1	Debris in Containment Emergency Sumps and Incorrect Screen Configurations	12/03/93	All holders of OLs or CPs for nuclear power reactors.
93-91	Misadjustment Between General Electric 4.16-KV Circuit Breakers and Their Associated Cubicles	12/03/93	All holders of OLs or CPs for nuclear power reactors.
93-90	Unisolatable Reactor Coolant System Leak Following Repeated Applications of Leak Sealant	12/01/93	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
 CP = Construction Permit

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Original signed by
 Brian K. Grimes

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DATE	07/13/93	08/09/93	11/03/93	01/03/93
D:DE	*OGCB:DORS	*C:OGCB:DORS	D:DORS	
JTWiggins	NECampbell	GHEMarcus	BKGrimes	
11/04/93	11/18/93	11/23/93	12/8/93	

DOCUMENT NAME: 93-95.IN

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DOCUMENT NAME: SWITCHIN.NEC

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NRC review of these events concluded that the safety-related equipment at the affected units performed as designed and there were no increased risks to the public.

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* Crystal River Unit 3, Brunswick Units 1+2, and Pilgrim Project Managers have reviewed this IN.

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with noted comments as corrected on enclosed WP floppy disk

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