POLICY ISSUE
INFORMATION

July 20, 2012 SECY-12-0101

FOR: The Commissioners

FROM: Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

SUBJECT: ISSUANCE OF BULLETIN 2012-01, "DESIGN VULNERABILITY IN ELECTRIC POWER SYSTEM"

PURPOSE:

To inform the Commission of the staff's intention to issue the attached bulletin. The bulletin requests information about the facilities' electric power system designs, in light of the recent operating experience at Byron Station.

SUMMARY:

Bulletin 2012-01 requests information from all holders of operating licenses and combined licenses for nuclear power reactors, except those that have permanently ceased operation and have certified that fuel has been removed from the reactor vessel.

The U.S. Nuclear Regulatory Commission (NRC) is issuing this bulletin to achieve the following objectives:

1. To notify the addressees that the NRC staff is requesting information about the facilities' electric power system designs, considering recent operating experience involving the loss of one of the three phases of the offsite power circuit (single-phase open circuit condition) at Byron Station, Unit 2, to determine if further regulatory action is warranted.

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2. To require that the addressees comprehensively verify their compliance with the regulatory requirements of General Design Criterion (GDC) 17, "Electric Power Systems," in Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," or the applicable principal design criteria in the updated final safety analysis report, and the design criteria for protection systems under 10 CFR 50.55a(h)(2) and 10 CFR 50.55a(h)(3).

3. To require addressees to respond to the NRC in writing, in accordance with 10 CFR 50.54(f).

BACKGROUND:

On January 30, 2012, Byron Station, Unit 2, experienced an automatic reactor trip from full power because the reactor protection scheme detected an undervoltage condition on the 6.9-kV buses that power reactor coolant pumps (RCPs) B and C (one of two phase undervoltage on two of four RCPs initiate a reactor trip). The undervoltage condition was caused by a broken insulator stack for the phase C conductor on the 345-kV power circuit that supplies both station auxiliary transformers. This insulator failure caused the phase C conductor to break off from the power line disconnect switch, resulting in a phase C open circuit and a high impedance ground fault. The licensee reviewed the event and identified design vulnerabilities in the protection scheme for the 4.16-kV safety-related engineered safety feature (ESF) buses.

Past operating experience also has identified design vulnerabilities associated with single-phase open circuit conditions at Beaver Valley Power Station, Unit 1 (BVPS1), James A. FitzPatrick (JAF) Nuclear Power Plant, and Nine Mile Point, Unit 1 (NMP1). These events involved offsite power supply circuits rendered inoperable by an open-circuited phase. The conditions went undetected for several weeks because offsite power was not aligned during normal operation, and the surveillance procedures, which recorded phase-to-phase voltage, did not identify the loss of the single phase.

DISCUSSION:

For current operating power plants designed before the promulgation of GDC 17, the updated final safety analysis report sets forth criteria similar to GDC 17, which requires, among other things, that plants have an offsite and an onsite electric power system with adequate capacity and capability to permit the functioning of structures, systems, and components important to safety in the event of anticipated operational occurrences and postulated accidents.

The plants with combined licenses reference the standard AP1000 design certified in 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," Appendix D. For AP 1000 reactors, the main alternating current (ac) power system is non-Class 1E and is not safety-related. During a loss of offsite power, ac power is supplied by the onsite standby diesel-generators, which are also not safety-related. However, the ac power system is designed such that plant auxiliaries can be powered from the grid under all modes of operation. Further, the ac power systems do supply power to equipment that is important to safety since that equipment serves defense-in-depth functions, as follows: The offsite power supply system provides power to the safety-related loads through the battery chargers, and both the offsite power system and the standby diesel generators provide defense-in-depth functions to supplement the capability of

the safety-related passive systems for reactor coolant makeup and decay heat removal. In this regard, offsite power is the preferred power source, and supports the first line of defense. In addition, the safety analyses take credit for the grid remaining stable to maintain reactor coolant pump operation for three seconds following a turbine trip in accordance with the guidance of RG 1.206. Accordingly, these electric power systems are important to safety, and subject to the requirements of GDC 17.

The events at BVPS1, JAF, and NMP1 involved offsite power supply circuits that were rendered inoperable by a single-phase open circuit but were undetected by the surveillances. At Byron, the loss of a single phase did not go undetected because one of the offsite circuits was feeding both safety-related buses and some nonsafety-related buses; instead, it initiated an electrical transient that resulted in a reactor trip and revealed a design vulnerability in the protection scheme for the 4.16-kV safety-related ESF buses.

The bulletin requires responses from all holders of operating licenses and combined licenses for nuclear power reactors, except those that have permanently ceased operation and have certified that fuel has been removed from the reactor vessel. The information will enable the staff to determine whether additional actions are needed to ensure compliance with existing regulatory requirements and whether enhancements to the existing regulations or guidance, or both, are necessary.

The staff intends to issue this bulletin by July 27, 2012.

COORDINATION:

The staff briefed the Committee to Review Generic Requirements (CRGR) on the proposed bulletin on May 2, 2012, and has addressed the CRGR's comments. The CRGR concluded that the information request is consistent with 10 CFR 50.54(f) and that the NRC is imposing no new requirements.

The Office of General Counsel (OGC) has reviewed the bulletin and has no legal objections to its content. In addition, OGC has determined that the proposed bulletin does not constitute a rule under the Small Business Regulatory Enforcement Fairness Act of 1996.

/RA by B. A. Boger Acting For/

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Enclosure:
PROPOSED NRC BULLETIN 2012-01
"Design Vulnerability of Electric System"

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