

May 1, 2003

MEMORANDUM TO: John A. Zwolinski, Director  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

FROM: Farouk Eltawila, Director **/RA/**  
Division of Systems Analysis and Regulatory Effectiveness  
Office for Nuclear Regulatory Research

SUBJECT: FINAL REPORT: "OPERATING EXPERIENCE ASSESSMENT –  
EFFECTS OF GRID EVENTS ON NUCLEAR POWER PLANT  
PERFORMANCE"

Attached is the final report entitled "Operating Experience Assessment-Effects of Grid Events on Nuclear Power Plant Performance." The report provides a comparison and assessment of loss of offsite power (LOOP) experience over two distinct periods of time, before deregulation (1985–1996) and after deregulation (1997–2001). Insights from the assessment of actual operating data indicate that following deregulation major changes have occurred in several factors important to the risk from a station blackout (SBO). They include: 1) the frequency of LOOP events at nuclear power plants (NPPs) has decreased, 2) the percentage of LOOPS longer than four hours has increased from approximately 17 percent to 67 percent, 3) most LOOP events occurred during the summer months, and 4) the probability of a LOOP as a consequence of a reactor trip has increased by a factor of 5 (from 0.002 to 0.01). These findings reinforce the need for licensees and the NRC to understand the condition of the grid. The NRC does not regulate the grid; however, the performance of offsite power is a major factor for NRC and licensee assessments of risk, especially with regard to emergency diesel generator (EDG) maintenance and outage activities. We plan to release the report for public comment and address these comments prior to issuance of the report in final form. We also plan to provide follow-on support for actions that result from the study.

With respect to maintaining the current levels of safety, the NRC and licensee assessments of risk that support EDG maintenance and outage activities should include: (a) assessment of offsite power system reliability, (b) the potential for a consequential LOOP given a reactor trip, and (c) the potential increase in the LOOP frequency in the summer (May to September). Regarding (a) above, the assessment of the power system reliability and risks from plant activities can be better managed through coordination of EDG tests with transmission system operating conditions. Based on recent discussions between NRR and RES, there is current industry guidance, as endorsed by the NRC, that include licensee assessment of offsite power for these activities. The condition of offsite power has sufficient impact for determination of

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risk for these types of maintenance activities and additional requirements may be needed. This may include the potential for backfit if current approaches are ineffective and review by the Committee to Review Generic Requirements (CRGR) will be needed.

Another important aspect of the changes to the electrical grid is the impact on the electrical analyses of NPP voltage limits and predictions of voltages following a reactor trip and whether a reactor trip will result in a LOOP. Recent experience shows that actual grid parameters may be worse than those assumed in electrical analyses due to transmission system loading, equipment out-of-service, lower than expected grid reactive capabilities, and lower grid operating voltage limits and action levels. NPP design basis electrical analyses used to determine plant voltages should use electrical parameters based on realistic estimates of the impact of those conditions.

Finally, with the structural and operational changes that have occurred in the industry, it is important to have mechanisms in place, such as contracts between the NPP and transmission company, to ensure that grid operators will provide reliable electrical power. Some regional grid operating entities manage and control operational and engineering activities in real time to maintain grid availability and reliability. Since external factors impact the ability of licensees to manage risks and understand the condition of the grid, some NPP licensees have implemented contractual agreements with grid operators to provide a mechanism for maintaining secure electrical power in the deregulated environment. Contractual arrangements should include specific electrical requirements, communication protocols, operating procedures and action limits, maintenance responsibilities, station blackout (alternate ac) power supply responsibilities, and NPP and grid technical requirements necessary to maintain adequate electrical supply to the NPP. Within its proper roles and responsibilities, the NRC should use the generic communication process to continue to alert licensees to deregulation issues for applicability to their facilities and consider actions, including the possible need for these mechanisms.

The assessment was initially issued for peer review on November 18, 2002 (ML023230007) and has been revised as appropriate to address comments from the Office of Nuclear Reactor Regulation (NRR), Nuclear Security and Incident Response (NSIR), RES, and Regions I, II, and IV. In addition, RES and NRR have met on several occasions in 2003 to discuss the findings of the assessment of the risk, and coordinate drafts of the report and this letter. Any additional comments will be addressed during the public comment period.

Attachment: As stated (**ML031220116, ML031220101**)

**ADAMS Package ML031220101**

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