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NUCLEAR REGULATORY COMMISSION  
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April 14, 2022

MEMORANDUM TO: Meraj Rahimi, Branch Chief  
Regulatory Guidance and Programs Management Branch  
Division of Engineering  
Office of Nuclear Regulatory Research

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SUBJECT: REQUEST FOR REVIEW OF PROPOSED GENERIC ISSUE  
PRE-GI-21, EMERGENCY DIESEL GENERATOR PROTECTIVE  
TRIPS BEING BYPASSED DURING LOSS OF OFFSITE POWER  
CONDITIONS

Per Yellow Ticket Y020220042 and in accordance with Office of Nuclear Reactor Regulation Office Instruction LIC-504, Revision 4, "Integrated Risk-Informed Decision-Making Process for Emergent Issues," effective June 2, 2014, the Long Term Operations and Modernization Branch (ELTB) has performed an assessment of the proposed Generic Issue (PRE-GI-21) and has determined that there is no immediate safety concern. The staff findings are summarized in the attached enclosure.

Enclosure:  
As stated

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SUBJECT: REQUEST FOR REVIEW OF PROPOSED GENERIC ISSUE PRE-GI-21,  
EMERGENCY DIESEL GENERATOR PROTECTIVE TRIPS BEING BYPASSED  
DURING LOSS OF OFFSITE POWER CONDITIONS DATED: April 14, 2022

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**ADAMS Accession No. ML22101A188****\*via e-mail****NRR-106**

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## **Issue Summary**

The Regulatory Guidance and Programs Management Branch received a proposed Generic Issue (GI) related to emergency diesel generator (EDG) protective trips being bypassed during loss of offsite power (LOOP) conditions (Agency Documents Access Management System (ADAMS) Accession No. ML22048B595). The GI program staff acknowledged receipt of the issue in a memorandum dated February 22, 2022 (ADAMS Accession No. ML22048B598). This proposed issue, designated as PRE-GI-21, has been entered into the Generic Issues Management Control System and can be viewed on the U.S. Nuclear Regulatory Commission (NRC) website on the GI Dashboard at <https://www.nrc.gov/about-nrc/regulatory/gen-issues/dashboard.html>. The submittal was also entered into the (ADAMS Accession No. ML22048B664).

In the proposed GI, the submitter identified the following issues:

1. Many EDG protection trips (mechanical and electrical trips) are being bypassed at many nuclear power plants (NPPs) under LOOP conditions. This is contrary to International Electrical and Electronic Engineering (IEEE) Standard (Std) 387, "IEEE Standard for Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," Revisions 1984, 1995, and 2017, in which the following is stated: "All protective devices shall remain effective during the diesel generator unit testing, and during operation in non-accident conditions." [Non-accident conditions would include LOOP]. NRC regulatory guidance (e.g., BTP EICSB-17, RG 1.9) is silent regarding protective trips bypass under LOOP condition.
2. Impacting the recovery of EDGs under LOOP conditions and potentially incorrect modelling of the recovery of EDGs during LOOP/Station Blackout (SBO) in the Standardized Plant Analysis Risk (SPAR) modelling by NRC, and similarly in the Probabilistic Risk Assessment (PRA) models by the licensees.

## **Evaluation**

The Office of Research, Division of Risk Analysis, Probability Risk Assessment Branch (PRAB) staff performed a risk-significant assessment for EDG protection trips bypass. A publicly available summary of this assessment is provided in Attachment 2 (ADAMS ML22048B594) to the proposed GI. The risk-significant assessment was performed based on two assumptions below:

1. Bypassing of protective trips could lead to non-recoverable EDG failures.
2. Bypassing of protective trips could have an impact on EDG performance.

Four SPAR models were assessed to determine the risk significance of the assumptions stated above. In the summary, the PRAB staff concluded that for the majority of NPPs, assuming no EDG recovery credited, the risk increase is expected to be very small; and there is no clear indication of higher failure rates or unavailability.

ENCLOSURE

The ELTB staff (as assisted by the PRA Oversight Branch (APOB), Office of Nuclear Reactor Regulation) reviewed the information in the proposed GI and the summary of the risk-significant assessment discussed above to evaluate the potential immediate safety concern. The staff's evaluations of the issues identified in the proposed GI is discussed below.

a. Meeting Current Regulations

Appendix A to Title 10, Code of Federal Regulations, Part 50, General Design Criterion (GDC) 17, "Electric power systems," requires, in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components that are important to safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a single failure.

If the EDG trips are bypassed when a LOOP occurs (Issue #1), the worst-case impact could be the EDG is damaged due to being unprotected. The redundant EDG(s) would be available to provide the required safety function; and therefore, GDC 17 continues to be met.

b. Maintaining Sufficient Defense in Depth

As stated above, if the EDG protection trips are bypassed when a LOOP occurs, the worst-case impact could be the EDG is damaged due to being unprotected. The redundant EDG(s), which is, required by General Design Criterion (GDC) 17, would be available to provide the required safety function. In this case, the long term reliability of the affected EDG may be reduced. The staff finds that under the above scenario, the remaining EDG and the implementation of flexible coping strategies (or FLEX) provide reasonable assurance that sufficient defense in depth is maintained.

c. Maintaining Sufficient Safety Margins

The redundancy in the onsite power supply system, the implementation and availability of flexible coping strategies (or FLEX) provide reasonable assurance that sufficient safety margins are maintained.

d. Ensuring Increases in Risk are Small

To evaluate the concern related to the impact of the recovery of EDGs under LOOP conditions (Issue #2), the PRAB staff performed a risk significance assessment. Four SPAR models were assessed to determine the risk significance based on the assumptions that the EDG recovery is not credited and the EDG failure rate is increased. The impacts of these assumptions vary depending on the plant's risk profile and SBO coping abilities. The assessment concluded that for the majority of plants, assuming no EDG recovery, the risk increase is expected to be very small.

While there is no clear indication of higher failure rates or unavailability of the EDG, the potential impacts (failure rates and unavailability) were assessed to provide a bounding estimate of those impacts. Even with these more conservative assumptions, the risk increase is expected not to exceed  $10^{-5}$  per year for any plants which is typically considered acceptable.

Regarding the concern of potential incorrect modelling of the recovery of EDGs during LOOP/ SBO in the SPAR modelling (Issue #2), the results from the four SPAR models in the risk assessment indicate that the assumption of not crediting EDG recovery does not have a

significant impact on the overall SPAR result. Furthermore, NUREG/CR-6890, "Reevaluation of Station Blackout Risk at Nuclear Power Plants," assesses the SBO risk and indicates that the average SBO core-damage frequency risk is approximately  $3 \times 10^{-6}$  per year.

Therefore, the staff concludes that the potential inability to recover an EDG as a result of bypassing these trips during a LOOP event, would have an overall small increase in risk and is not an immediate safety concern.

e. Performance Monitoring

The operating reactor fleet is under continuous performance monitoring. This is accomplished both through the reactor oversight program (ROP) and its associated inspection programs as well as other regulatory requirements. Numerous inspections focus on analyzing negative trends and identifying appropriate implementation of corrective actions to address those issues. Problem and identification and resolution, maintenance effectiveness, and surveillance testing, are some of the examples available to inspectors to identify potential emerging degradation of critical EDG parameters.

**Conclusion**

The ELTB staff considered the risk assessment performed by the PRAB staff and reviewed relevant documents to evaluate the potential immediate safety concern related to the issues identified in the proposed GI. The staff finds there is sufficient defense in depth because even if an EDG were to be damaged, redundancy in the onsite power supply would still ensure the plant can safely shutdown and maintain it in safe condition. Based on the evaluations above, the staff concludes that there is no immediate safety concern and that the operating plants continue to provide an adequate level of protection. The plants may continue to operate safely without any immediate action required. The issues identified in the proposed GI do not adversely affect public health and safety, the common defense and security, or the environment (with respect to radiological health and safety).