

# REGULATORY ANALYSIS

## DRAFT REGULATORY GUIDE (DG)-1477

### APPLICATION AND TESTING OF ONSITE EMERGENCY ALTERNATING CURRENT POWER SOURCES IN PRODUCTION AND UTILIZATION FACILITIES

(Proposed Revision 5 of Regulatory Guide 1.9, previous revision issued March 2007)

#### 1. Statement of the Problem

This document presents the regulatory analysis of the U.S. Nuclear Regulatory Commission's (NRC's) proposed Revision 5 of Regulatory Guide (RG) 1.9, "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants." The previous revision, Revision 4 of RG 1.9 was issued March 2007, and endorses Institute of Electrical and Electronics Engineers (IEEE) Standard (Std) 387-1995, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations." The NRC is issuing proposed Revision 5 of this RG to provide current guidance based on the generally accepted methods and procedures for emergency diesel generators (EDGs), combustion turbine generators (CTGs), and onsite emergency power sources other than EDGs and CTGs. Proposed Revision 5 endorses the updated standards released by International Electrotechnical Commission (IEC) and IEEE for emergency AC standby power supplies:

- IEC/IEEE Std 63332-387:2024, "Nuclear facilities—Electrical power systems—Diesel generator units applied as standby power sources"
- IEEE Std 2420-2019, "IEEE Standard Criteria for Combustion Turbine-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations"

This revision of this guide (Revision 5) is updated to reflect these new standards. These updated standards delineate principal design criteria, qualification, and testing guidelines to ensure EDGs and CTGs will meet, among other requirements, Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," namely the requirements for electrical power systems (General Design Criterion (GDC) 17, "Electric power systems" and GDC 18, "Inspection and testing of electric power systems").

In addition, since the publication of RG 1.9, Rev. 4, the NRC has reviewed numerous applications under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52 and gained operating experience on the subject. As such, RG 1.9 Rev 5 incorporates new information from the EDG standard, adds CTGs, and includes 10 CFR Part 52 and other nuclear facilities in the scope. Revision 5 is the result of lessons learned from license amendment review activities and inspections, industry operating experience, design certification reviews, combined license application reviews, and NRC staff analysis, and it identifies enhancements to the guidance that could improve the quality of the testing program by verifying the performance characteristics of EDGs used to provide emergency power to nuclear power plants. Furthermore, this revision of this guide (Revision 5) includes specific guidance on CTGs and onsite emergency AC power sources other than EDGs and CTGs.

## 2. Objective

The objective of this regulatory action is to assess the need to update the NRC guidance on the application and testing of safety-related standby power supplies in production and utilization facilities.

## 3. Alternative Approaches

The NRC staff considered the following alternative approaches:

- (1) Do not revise RG 1.9.
- (2) Withdraw RG 1.9.
- (3) Revise RG 1.9 to address the current methods and procedures.

### Alternative 1: Do Not Revise Regulatory Guide 1.9

Under this alternative, the NRC would not issue additional guidance and the current guidance would be retained. If the NRC does not take action, there will be no changes in costs or benefits to the public, licensees, or the NRC. This alternative is considered the “no action” alternative and provides a baseline condition from which any other alternatives will be assessed. Under the “no action” alternative, there would be no cost to the NRC for revising the guide. However, the NRC’s knowledge gained from licensing and oversight processes, the operational experiences and lessons learned from the last 18 years of industry practice since RG 1.9 Rev. 4 was issued, and updated industry standards would not be available in the guidance. Licensees and applicants would not experience the benefits from the endorsement of the updated IEC and IEEE standards including the additional guidance on CTGs or onsite emergency AC power sources other than EDGs and CTGs, if the RG is not revised. By not adding the additional guidance, the NRC staff may have to ask additional questions of applicants and licensees, resulting in longer times to complete new license and license amendment requests.

### Alternative 2: Withdraw Regulatory Guide 1.9

Withdrawing this RG would eliminate the existing endorsement of the previous IEC and IEEE standards including the guidance on methods and procedures acceptable to the NRC for the testing of diesel generators used as emergency power sources. Even though little NRC staff effort is needed to withdraw this RG, this option has no obvious benefit. The NRC staff would document a short evaluation of the withdrawal and then post in the *Federal Register*.

Applicants, licensees, and NRC staff would all be burdened by a withdrawal. Without acceptable guidance, applicants and licensees would have to propose and justify methods and procedures for testing new or replacement diesel generators. Withdrawing the RG would eliminate the well-established technical and regulatory framework on EDGs and would eliminate active guidance for the NRC staff, and applicants and licensees that submit a license amendment request or application. The NRC staff would be tasked to review and approve each alternative method and procedure. These reviews could require extensive time and effort and potentially involve multiple rounds of questions to the applicant or licensee. These questions will impose a burden on the NRC staff in preparing them, reviewing them, and determining a path forward following review. Applicants and licensees would be burdened by having to respond to the questions. If additional questions are needed, they would extend the length of an application review and impact licensees’ schedules and workloads.

### Alternative 3: Revise Regulatory Guide 1.9

Under this alternative, the NRC staff would revise RG 1.9 to reflect the current NRC staff recommendation for testing and validating safety-related EDGs. This enhanced programmatic guidance is the result of lessons learned from license amendment review activities, inspections, and industry operating experience review and analysis by the NRC staff. In addition, RG 1.9 would be revised to include guidance for testing and validating safety-related CTGs and onsite emergency AC power sources other than EDGs and CTGs. Further, a revision of RG 1.9 would include risk-informed, performance-based perspectives and would apply to any upcoming advanced or small modular reactors. A revision to RG 1.9 would clarify the applicability to licensees and applicants under 10 CFR Part 52 and other nuclear facilities.

A revision to RG 1.9 would benefit the NRC staff, applicants, and licensees by providing guidance based on current generally accepted methods and procedures for testing and validating onsite emergency AC power generators. Further, a revision to RG 1.9 is beneficial since it would provide guidance on CTGs and onsite emergency AC power sources other than EDGs and CTGs. A revision to RG 1.9 would endorse recent industry guidance that describes acceptable methods for application and testing criteria for emergency AC power generators as required by GDC 17 and GDC 18, thereby enhancing regulatory stability. This additional guidance would benefit the NRC staff and the applicant or licensee by reducing or eliminating the need for multiple rounds of requests for additional information to determine whether they meet current standards and have addressed lessons learned and operating experience.

The impact to the NRC would consist of the costs associated with preparing and issuing the RG. The impact to the public would consist of the voluntary costs associated with reviewing the draft guide and providing comments to the NRC during the public comment period. The value to the NRC staff and license applicants would lie in the enhanced efficiency and effectiveness provided by the use of an updated common guidance document that endorses updated industry standards, and incorporates lessons learned, and operating experience as the technical basis for license applications and for other interactions between the NRC and the entities it regulates. Further, a revision of RG 1.9 would benefit NRC staff and license applicants by providing a technical and regulatory framework for CTGs and onsite emergency AC power sources other than EDGs and CTGs.

## **4. Comparison of Alternatives**

The staff compared the alternatives against each other with respect to safety and the NRC's and applicants'/licensees' resources.

With respect to Alternative 1, not revising the RG would not increase safety because no change would be made to the existing guidance. The NRC staff, applicants, and licensees would continue to use the current RG with additional requests for guidance from applicants and licensees and extended review periods by the NRC staff. Failure to update the RG would cost nothing in the short term; however, it would result longer review time for the NRC staff and additional work by licensees and applicants to address additional questions and testing requirements developed by the NRC staff, relative to the update to the RG proposed in Alternative 3 that would streamline review by incorporating lessons learned, operating experience, and updated industry standards. Regulatory guidance and stability would remain unchanged because the RG would remain unchanged. This "no action" alternative would continue the current level of predictability and transparency. However, given the NRC's

expectation for future applications and licensee-initiated changes, the current guidance would be insufficient since licensees and applicants often utilize the most recent standards.

Withdrawing the RG (Alternative 2) would eliminate the technical and regulatory framework on EDGs for the NRC staff and applicants and licensees that submit a license amendment request or application. This loss of regulatory guidance would create the need for additional resource expenditures by the NRC staff, applicants, and licensees because each licensing action would be reviewed on a case-by-case basis, requiring more staff hours to evaluate and resolve. The lack of publicly available guidance would also adversely impact regulatory stability, predictability, public transparency, and public confidence by requiring a case-by-case evaluation of new or revised license amendments.

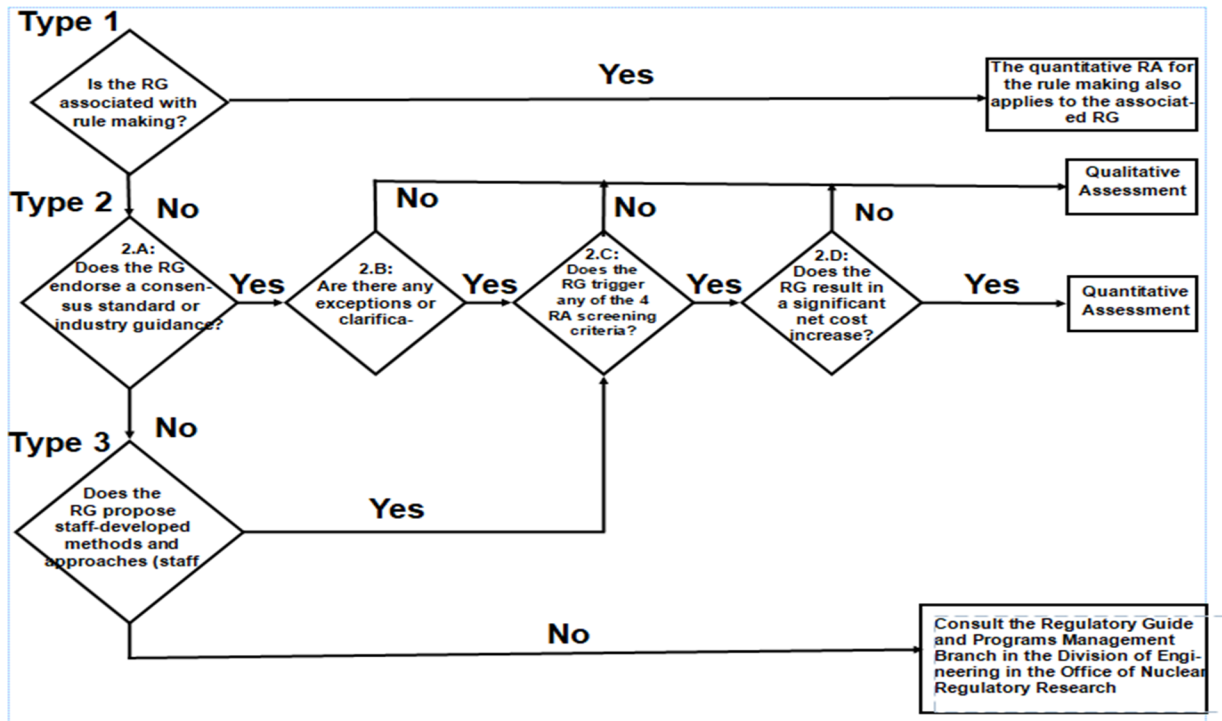
With respect to NRC resources, Alternative 3 represents the greatest initial cost to the NRC, which is attributable to the costs associated with preparing and issuing the RG revision. With respect to applicants' and licensees' resources, Alternative 3 results in the fewest costs. Having a new revision should reduce the need for requests for additional information because it would endorse updated industry standards and reflect lessons learned and operating experience and, therefore, reduce the need for applicants and licensees to perform additional analyses to address them. The NRC evaluated whether a qualitative or quantitative analysis would be required. Refer to Appendix A to see the process used to conclude a qualitative analysis suffices for this revision.

Revising the RG would enhance safety because the revision would incorporate the most current information into the NRC guidance on the application verification and testing of EDGs, include guidance on CTGs and other onsite emergency AC power sources other than EDGs and CTGs, and provide guidance to applicants and licensees under 10 CFR Part 52. This should enhance the reliability of the EDGs and could improve plant safety. Revising the RG would provide a technical and regulatory framework on CTGs, onsite emergency AC power sources other than EDGs and CTGs, licensees and applicants under 10 CFR Part 52 and other nuclear facilities. Regulatory stability and predictability would improve with a revision to the RG. Additionally, a revision would enhance public transparency and confidence because the revised RG would provide consistent guidance to all stakeholders and allow the public to better understand the NRC staff review process. Efficiency in the NRC's licensing and oversight activities would increase by bringing consistency to the guidance for GDC 17 and 18.

## **5. Conclusion**

Based on this regulatory analysis, the NRC staff concludes that the issuance of a new revision is warranted. The action will enhance safety and provide guidance on methods and procedures for EDGs and CTGs.

Appendix A  
 Determination of Whether a Qualitative or Quantitative Analysis is Required



**Figure A-1, Flow Chart for Evaluating whether a Quantitative Evaluation is Required**

Type 1 RGs: (Is the RG associated with rulemaking?)

**No.**

Type 2 RGs: (Is the RG associated with endorsing consensus Codes & Standards or an industry guidance?)

**Yes.** This RG discusses design and testing of onsite emergency alternating current power sources in production and utilization facilities and endorses, with clarifications:

- IEC/IEEE Std 63332-387:2024, “Nuclear facilities—Electrical power systems— Diesel generator units applied as standby power sources”
- IEEE Std 2420-2019, “IEEE Standard for Combustion Turbine Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations”

Decision 2.B: Are there any staff-imposed conditions?

**Yes.**

Section C, Part 1, of this RG supplements several sections of IEC/IEEE Std 63332-387:2024, and does not endorse Section 2, “Normative References,” of IEC/IEEE 63332-387:2024, nor Annex A through F.

In addition, Section C, Part 2, of this RG supplements several sections of IEEE Std 2420-2019. Also, Section C does not endorse Section 2, “Normative References,” of IEEE Std 2420-2019, nor Annex A through E.

Appendix A  
Determination of Whether a Qualitative or Quantitative Analysis is Required

Decision 2.C: Does the RG trigger any of four criteria,

1. Are there any significant impacts on applicant/licensee design criteria, describe the impact and then proceed to next criterion.

**No, the design criteria for onsite emergency alternating current power sources are consistent with current practices and regulations and do not impact applicant/licensee design criteria.**

2. Are there any significant impacts on applicant/licensee operating and maintenance programs, describe the impact and then proceed to next criterion.

**No, the maintenance considerations for onsite emergency alternating current power sources are consistent with current practices and do not impact operating and maintenance programs.**

3. Are there any significant impacts on applicant/licensee training program, describe the impact and then proceed to next criterion.

**No, the testing considerations for onsite emergency alternating current power sources are consistent with current practices and do not impact training programs.**

4. Are there any significant impacts on applicant/licensee equipment, describe the impact

**No, there are no impacts to licensee equipment in operating reactors. Applicants would be able to use the latest guidance, when issued.**

Decision 2.D: Does the impact from the four criteria result in a net significant cost increase. Estimate the magnitude of cost increase/decrease associated with the four criteria.

**No.**

This additional guidance would benefit the NRC staff and the applicant or licensee by reducing or eliminating the need for multiple rounds of requests for additional information to determine whether they meet current standards. The value to the NRC staff and license applicants would lie in the enhanced efficiency and effectiveness provided by the use of an updated common guidance document that incorporates operating experience and lessons learned as the technical basis for license applications and for other interactions between the NRC and the entities it regulates.

Type 3 RGs: Does the RG propose staff-developed methods?

**Yes.**

Section C of RG 1.9, Part 3, provides acceptable design and testing considerations for onsite emergency AC power sources other than EDGs and CTGs to meet the agency's regulatory requirements. It provides one acceptable method to meet applicable NRC regulations on onsite emergency alternating current power sources, including but not limited to electric power systems, quality assurance, and fire protection.

Summary and Conclusion

**Based on this analysis a quantitative RA for RG 1.9 is not required, a qualitative RA will suffice.** The impact to the NRC would consist of the costs associated with preparing and issuing the RG. The impact to the public would consist of the voluntary costs associated with reviewing the draft guide and providing comments to the NRC during the public comment period. Revising the RG would be beneficial for applicants

## Appendix A

### Determination of Whether a Qualitative or Quantitative Analysis is Required

and licensees because the revision would incorporate the most current information into the NRC guidance on the application verification and testing of EDGs, would include guidance on CTGs and other onsite emergency AC power sources other than EDGs and CTGs, would provide guidance to applicants and licensees under 10 CFR Part 52 and other nuclear facilities.