

## Regulatory Guide Periodic Review

Regulatory Guide Number: **1.41**

Title: **Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments**

Office/division/branch: **NRO/DCIP/QVIB**

Technical Lead: **Thomas Kendzia**

Recommended Staff Action: **Revise**

### 1. **What are the known technical or regulatory issues with the current version of the Regulatory Guide (RG)?**

Regulatory guide (RG) 1.41, "Preoperational Testing of Redundant On-Site Electric Power Systems To Verify Proper Load Group Assignments," published March 1973 is used with RG 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems (Safety Guide 6)" and RG 1.32, "Criteria for Power Systems for Nuclear Power Plants" to verify proper load group assignments and electrical independence between redundant load groups. RG 1.41 expands on Section 5.2.2.5 of the Institute of Electrical and Electronics Engineers (IEEE) Standard 308-1971, "IEEE Standard Criteria for Class 1E Electric Systems for Nuclear Power Generating Stations" which states ... "*Auxiliary devices that are required to operate dependent equipment shall be supplied from a related bus section to prevent loss of electric power in one load group from causing the loss of equipment in another group.*"

The IEEE standard has been revised and updated to IEEE Std. 308-2012, and the applicable section (5.2.2.5 Auxiliary Systems) has been renumbered to Section 5.2.2.4, Auxiliary Systems, but the recommendation is unchanged. The references do not include the correct version of IEEE 308, do not reference Part 52 requirements, and do not include references to RG 1.68, 1.70, and 1.206, which would be appropriate.

RG 1.41 was initially developed to provide guidance on preoperational testing of on-site electrical power systems important to safety, for load group assignments, electrical separation, and redundancy. Since that time, the Commission has amended its regulations for loss of all alternating current power (Station Blackout, § 50.63), loss of large areas of the plant due to explosions or fire (§ 50.54 (hh)(2)), and has established a new combined (construction and operating) licensing process (under Part 52).

The Commission issued Order Environmental Assessment (EA)-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events" which requires, in part, "licensees or construction permit holders shall develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and SFP cooling capabilities following a beyond design basis external event," and "these strategies must be capable of mitigating a simultaneous loss of all alternating current power and loss of normal access to the

ultimate heat sink and have adequate capacity to address challenges to core cooling, containment, and Spent Fuel Pool (SFP) cooling capabilities at all units on a site subject to this Order”. Additional requirements in response to Fukushima lessons learned are in development.

The current RG 1.41 recommends testing Class 1E electrical systems to verify that they are not cross-connected such that a single event could cause faults in multiple trains and that they are not cross-dependent such that a single event could cause the loss of required support systems for multiple trains. The RG does not address non Class 1E systems that may be required and used by station emergency procedures to respond to loss of all alternating current power (Station Blackout, § 50.63), loss of large areas of the plant due to explosions or fire (§ 50.54 (hh)(2)), and Order EA-12-049.

**2. What is the impact on internal and external stakeholders of not updating the RG for the known issues, in terms of anticipated numbers of licensing and inspection activities over the next several years?**

Currently RG 1.41 recommends testing Class 1E electrical systems to verify that they are not cross-connected such that a single event could cause faults in multiple trains and that they are not cross-dependent such that a single event could cause the loss of required support systems for multiple trains. The RG does not address non Class 1E electrical systems that may be required and used by station emergency procedures to respond to loss of all alternating current power (Station Blackout, § 50.63), loss of large areas of the plant due to explosions or fire (§ 50.54 (hh)(2)), and Order EA-12-049.

Revising the RG to address some or all of these additional requirements would result in additional testing for new plant construction (currently 4 plants at two sites) or existing plant significant modifications to ensure the installation for non-Class 1E electrical systems met the design requirements and that unforeseen cross-connections and cross-dependencies do not exist. This additional testing is outside the normal scope of NRC inspection activities. The additional requirements in response to Fukushima lessons learned may affect the NRC inspection scope.

Not revising the RG will not change current licensing or inspection activities for the internal or external stakeholders. Additional requirements in response to Fukushima lessons learned may affect both licensing and inspection. Not revising the RG could subject the NRC to questioning from the public during future licensing activities, as to the adequacy of NRC recommendations for testing of design features that the NRC requires by regulation, to ensure the station can implement its emergency and beyond design basis accident procedures to protect the public health and safety.

**3. What is an estimation of the level of effort needed to address identified issues in terms of FTE and contract dollars?**

NRC staff requires approximately 1.6 FTE to revise the RG to recommend testing of both safety and non-safety related busses to verify that no cross-connections or cross-dependencies exist. This testing will help assure that a single event will not adversely impact multiple busses or trains.

Another option is to coordinate with the response as it is getting finalized; this option would take more resources such as an additional FTE.

4. **Based on the answers to the questions above, what is the staff action for this guide (Reviewed with no issues identified, Reviewed with issues identified for future consideration, Revise, or Withdrawal)?**

Revise.

5. **Provide a conceptual plan and timeframe to address the issues identified during the review.**

Current status - the RG has been drafted and was sent out for public comment. NEI provided comments to the draft guide and does not want to test electrical separation of non-Cat 1E electrical systems. NRO is currently gathering Operating Experience (OpE) to support the need for testing (ongoing).

The unknown is the final requirements in response to Fukushima lessons learned and how they could affect or replace the need for this revision. Incorporating the impact of final requirements in response to Fukushima lessons learned into the RG is estimated to take 3 months. After incorporating the Fukushima lessons learned into the RG we would need to hold internal NRC meetings (NRO, NRR, RES) to get NRC alignment (6 months), then we would have public meetings to explain the NRC proposed revisions, receive additional public comments, and address NEI comments (another 6 months).

**NOTE: This review was conducted in September 2014 and reflects the staff's plans as of that date. These plans are tentative and are subject to change.**