

**Enclosure 4**  
**Resolution of Comments on Draft Regulatory Guide DG-1155**  
**(Proposed Rev 2 to Regulatory Guide 1.129)**

Originator	DG-1155 Section	Specific Comment	NRC Comment Resolution
NEI / Russell Bell (ML063260405)	General Comment #1	"For DG-1155, it is more appropriate to keep the NRC guidance consistent with the IEEE requirement to perform temperature adjustments after battery testing rather than before testing as proposed by the NRC."	Staff agrees with this comment. Staff will incorporate changes in the RG.
	General Comment #2	"Both the ESBWR and AP-1000 Design Certification Documents (DCDs) state that this Reg Guide is not applicable to design certification, thus compliance with the RG it is the responsibility of the COL applicant."	Staff agrees with this comment. 10 CFR 52.63, "Finality of the Standard Design Certifications" remains applicable to the certified designs. No changes are required. COL applicants need to address this RG per staff recommended final rule 52.79(a)(41).
	General Comment #3	"Industry reviewers believe that the requirements from DG-1145 (DG-1155) outside of TS will be addressed via station procedures and programs, and that no changes to the generic TSs proposed will be required. Does the NRC plan on requiring additional TS items to meet the DG-1155 items?"	Staff disagrees with this comment. This question will be addressed during licensing reviews if applicable. No changes are required.
	C.2	Requirement: "1E Battery float current and voltage measured & recorded weekly" Tech Spec Requirement: "Battery terminal voltage > float voltage 1 per 7 days / Battery float current < limit 1 per 7 days" Differences: "None"	Staff agrees with this comment. No changes are required.

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	C.2	Requirement: "Monthly checks. Float voltage" Tech Spec Requirement: "Refer to above" Differences: "IEEE standard requires 1 /month float voltage check; DG-1155 requires 1 / 7 days, which is reflected in AP-1000 & ESBWR Tech Specs"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Monthly checks. Battery general appearance & cleanliness" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Monthly checks. Charger output & current" Tech Spec Requirement: "None" Differences: "Tech Specs SR 3.8.1.2 requires Battery Charger test 1/24 months"	Staff agrees with this comment. Staff has taken no exceptions on this subject, therefore it is an endorsed part of the standard. No changes are required.
	C.2	Requirement: "Monthly checks. Electrolyte levels" Tech Spec Requirement: "each battery connected cell electrolyte level > limit 1/31 days" Differences: "None"	Staff agrees with this comment. No changes are required.

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	C.2	Requirement: "Monthly checks. Cracks in cell or leakage" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Monthly checks. Corrosion checks" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Monthly checks. Ambient temperature" Tech Spec Requirement: "None" Differences: "Both ESBWR & AP-1000 HVAC for 1E battery rooms are not safety related; Power Generation requirement for temperature control (reference DCD section 8.3.2 & 9.4)"	Staff agrees with this comment. 10 CFR 52.63, "Finality of the Standard Design Certifications" remains applicable to the certified designs. No changes are required. COL applicants need to address this RG per staff recommended final rule 52.79(a)(41).
	C.2	Requirement: "Monthly checks. Pilot cell voltage & electrolyte temperature" Tech Spec Requirement: "Check Pilot cell voltage & electrolyte temperature within limits 1/31 days" Differences: "None"	Staff agrees with this comment. No changes are required.

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	C.2	Requirement: "Monthly checks. Float charging current or pilot cell specific gravity" Tech Spec Requirement: "See item C.4 above" (Battery Service Test 1/24 months) Differences: "Float current checked with voltage on a daily basis per Tech Specs"	Staff disagrees with this comment. Float charging current is required to be checked once every 7 days, while the pilot cell specific gravity has no specific requirements in Tech Specs. Both are methods to determine the state of charge. The method to determine the state of charge is selected based on the battery cell plate metallurgy. Specifically, using stabilized charging current to determine a fully charged condition is the recommended practice for lead-calcium batteries, and using electrolyte-specific gravity and battery float voltage measurement readings is the recommended practice for lead-antimony batteries. No changes are required.
	C.2	Requirement: "Monthly checks. Unintentional battery grounds" Tech Spec Requirement: "None" Differences: "Grounds will cause alarms which require response"	Staff disagrees with this comment. In cases where unintentional grounding is alarmed, it is corrected promptly. In the absence of a grounding alarm, monthly verification is desired. No changes are required.
	C.2	Requirement: "Monthly checks. Battery monitoring systems" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. Monthly checks evaluated in the RG are considered essential for safety function. No changes made to current language.

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	C.2	Requirement: "Quarterly checks. Voltage of each cell" Tech Spec Requirement: "Verify each battery connected cell voltage above limit" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Quarterly checks. Specific gravity of 10% of cells if battery float charging current is not used to monitor state of charge" Tech Spec Requirement: "See item C.4 above" (Battery Service Test 1/24 months) Differences: "Float current checked with voltage on a daily basis per Tech Specs for State of Charge (SOC) check."	Staff agrees with this comment. Tests at frequencies higher than what it is specified in the RG are options available to the licensees for addressing potential problems. No changes are required.
	C.2	Requirement: "Quarterly checks. Electrolyte temperature of 10% or more of the battery cells" Tech Spec Requirement: "None" Differences: "Check pilot cell electrolyte temperature within limits 1/31 days per AP-1000 SR 3.8.7.4 & ESBWR SR 3.8.4.4; no requirement for 10% of cells to be checked on quarterly basis."	Staff agrees with this comment. 10 CFR 52.63, "Finality of the Standard Design Certifications" remains applicable to the certified designs. No changes are required. COL applicants need to address this RG per staff recommended final rule 52.79(a)(41).

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	C.2	Requirement: "Yearly checks. Specific gravity and temperature of each cell" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Yearly checks. Cell condition (detailed visual)" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Yearly checks. Cell to cell terminal connection resistance" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.2	Requirement: "Yearly checks. Structural integrity of battery rack / cabinet" Tech Spec Requirement: "None" Differences: "None"	Staff agrees with this comment. No changes are required.

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	C.4	Requirement: "Service testing. DG requires Service Test on interval not to exceed 24 months" Tech Spec Requirement: "Battery Service Test 1/24 months" Differences: "None"	Staff agrees with this comment. No changes are required.
	C.5	Requirement: "Acceptance testing. DG requires Service Test for Acceptance test following initial installation" Tech Spec Requirement: "None" Differences: "Tech Specs do not cover initial or post-maintenance testing"	Staff agrees with this comment. This comment will be more appropriately addressed in RG 1.128. It will be deleted from this RG and relocated to RG 1.128.
	C.5	Requirement: "Performance testing. Performance test within first 2 years of service " Tech Spec Requirement: "Performance Test 1/60 months (5 years)" Differences: "Service Test 1/24 months should bound this requirement"	Staff disagrees with this comment. No changes are required.

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	C.5	Requirement: "Performance testing. Period performance testing; interval not greater than 25% of expected service life " Tech Spec Requirement: "None" Differences: "Tech Specs on this. A typical expected service life for a lead calcium battery is between 10 and 20 years. A 25% test interval at a minimum would equate to 1 / 2.5 years. The Service Test 1 / 2 years should cover this requirement."	Staff agrees with this comment. Performance testing shall be performed at an interval not greater than 25% of its service life and a service test shall be performed at least once every two years. The service test cannot be substituted with a performance test and viceversa. If a modified performance test is used in lieu of the performance and/or service test, the test should be performed at intervals not exceeding 24 months. No changes are required.
	C.5	Requirement: "Performance testing. Annual performance testing if battery degraded or at 85% of service life and capacity <100%" Tech Spec Requirement: "Annual performance testing if battery degraded or at 85% of service life and capacity <100%" Differences: None	Staff agrees with this comment. No changes are required.
	C.5	Requirement: "Performance testing. Performance testing 1/24 months if battery degraded or at 85% of service life and capacity >=100%" Tech Spec Requirement: "Performance testing 1/24 months if battery degraded or at 85% of service life and capacity >=100%" Differences: None	Staff agrees with this comment. No changes are required.

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	C.5	Requirement: "Performance testing. Optional baseline / benchmarking testing" Tech Spec Requirement: None Differences: None	Staff agrees with this comment. No changes are required.
	C.6	Requirement: "Modified Performance Testing. IEEE std states Modified Performance Test may be used in place of Service Test; DG states acceptable, BUT same test method should be used throughout battery life." Tech Spec Requirement: "Note that TS allows Modified Performance Test in lieu of Service Test" Differences: "Requirement to assure same test method throughout battery life not captured in Tech Specs."	Staff disagrees with this comment. The same test method should be kept in order to detect battery degradation. "For best trending results, the same test methods should be used throughout the battery life." No changes are required.
EPRI (ML063260405)	B Discussion, 1 <sup>st</sup> para, 4 <sup>th</sup> sentence	Comment: Clarification of the wording Proposed Alternate: "This recommended practice...the battery in a fully charged state and provides power to the direct current (dc) loads."	Staff agrees with this comment. RG will be revised to incorporate this comment.
	B Discussion, 2 <sup>nd</sup> para, 5 <sup>th</sup> sentence	Comment: Clarification of wording Proposed alternate: "Remove the word "that" after ensure"	Staff agrees with this comment. RG will be revised to incorporate this comment.

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	C Regulatory Position 3(d)	<p>Comment: The proposed wording is for this section makes a valid point of ensuring that the battery is actually accepting a charge; however, the discussion is not, it makes recommendations that are just “additional anecdotal things to do (e.g., three hourly readings) Proposed Alternate: “Suggest dropping the current wording in Item (d) and use the information provide in Annex A of the IEEE 450-2002.”</p>	Staff disagrees with this comment. The RG does not endorse Annex A, it is for information only. No changes are required.
	C Regulatory Position 7	<p>Comment: If performing a service or modified performance test, a battery should be tested in its “as-found” condition and the temperature can not be adjusted. Proposed Alternate: “Depending on the type of test being performed, the temperature adjustment should be done after the test is performed.”</p>	Staff agrees with this comment. RG will be revised to incorporate the changes.
	C Regulatory Position 8	<p>Comment: “Appendix I has been referred to C 6. Also, it has been suggested that Annex A be used for Item C 7” Proposed Alternate: “Suggest revisiting the idea of wholesaley excluding Annexes A through K. There may be some items that would enhance the RG it the Annexes were selectively utilized.”</p>	Staff agrees in part. Staff has endorsed Annexes E, F and I. RG will be revised to incorporate the changes.
Mark S. Clark (ML063260397)	General	<p>Comment: “IEEE 450 is a recommended practice. It is</p>	Staff disagrees with this comment. NRC uses industry consensus standards for providing

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		incorrect to refer to it as a standard. For consistency, the abbreviation Std should be removed from all locations.”	regulatory guidance. The renaming does not change the subject matter. No changes are required.
	B Discussion, 1 <sup>st</sup> paragraph	Comment: Delete: “...IEEE Standard 450 Working Group, Maintenance and Testing Subcommittee of the Power Engineering Society Stationary Battery Committee (Standards Coordinating Committee 29)” Proposed Alternate: “...IEEE Power Engineering Society Stationary Battery Committee, (previously IEEE Standards Coordinating Committee SCC-29)”	Staff disagrees with this comment. The words are consistent with the published standard. No changes are required.
	B Discussion, 4 <sup>th</sup> paragraph	Comment: “Normative Annexes are part of the document and endorsement of the document includes this annex.”	Staff agrees with this comment. Staff will endorse Annex I because of it is a Normative Annex and the RG will be revised to incorporate the changes.
	B Discussion, 5 <sup>th</sup> paragraph	Comment: “This statement is incorrect. 450-1975 adjusted for temperature after the test. It is a change from IEEE 450-1980 through 1995 which were never endorsed by the NRC. The change back to post test temperature correction was driven by the adoption of the modified performance test. Applying a temperature correction to the discharge rates prior to performing a service or modified performance test can result in discharge rates less than the battery load profile and is therefore not allowed in Annex I. There is also significant industry	Staff agrees with this comment. The RG will be revised to incorporate the changes.

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		experience to show that many errors in testing have been made by incorrect application of the correction factor prior to testing. For these reasons, the working group made the decision to return to post test temperature correction and applied it to all tests for consistency. Since this was a return to the original test methodology, no technical justification was required.”	
	C Regulatory Position, 1 <sup>st</sup> paragraph, 1 <sup>st</sup> sentence	Comment: “The wording change was done for consistency with 1154.” Proposed Alternate: Delete “specifications” and replace with “requirements denoted by the verb shall and recommendations denoted by the verb should”	Staff agrees with this comment. The RG will be revised to incorporate the changes.
	C Regulatory Position, part (2)	Comment: “This requirement exists in TSTF-360 and the text needs to be clear it is a requirement.” Proposed Alternate: Delete “should” and replace it with “shall”	Staff agrees with this comment. The RG will be revised to incorporate this comment.
	C Regulatory Position, part (2), last sentence	Comment: Add “See Annex A.2 and A.4 for additional information.”	Staff disagrees with this comment. Staff does not endorse annexes as they are for information only. The exceptions will be addressed, if any. No changes are required.
	C Regulatory Position, part (5)	Comment: Add “Service Test or Modified Performance Test” after “...a test of the battery’s capability...”	Staff agrees with this comment. The RG will be revised to incorporate the changes.

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	C Regulatory Position, part (5)	<p>Comments:</p> <p>“1. This statement is not based on IEEE 450 recommendations or requirements and does not belong in Reg. Guide 1.129. It is based on IEEE 336 pre-operational test requirements and IEEE 484-6.3.4 acceptance test requirements. Please select one of the following options: remove the requirement, re-locate the requirement to the IEEE 336 Reg. Guide, relocate the requirement to Reg. Guide 1.128 or provide bases information in this section identifying the source document(s) and requirement. The recommendation is to relocate the requirement to Reg. Guide 1.128 which describes the other installation test requirements.</p> <p>2. More importantly, this statement assumes a factory acceptance test was performed. If a factory acceptance test was not performed then a modified performance test or both a service and performance test is/are required at installation to meet the requirements of IEEE 336 for pre-operational testing and IEEE 484-6.3.4 for post installation testing.”</p>	Staff agrees with this comment. It will be deleted from this RG and relocated to RG 1.128.

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	C Regulatory Position, part (6)	<p>Comments:            "You cannot adjust for temperature prior to a modified performance test because doing so could result in test rates below the battery load profile. In addition, NORMATIVE Annex I 'Rules for Modified Performance Tests' specifically states to not adjust for temperature prior to the test. Therefore, this statement is technically incorrect and in conflict with Item 6 above must be removed."</p>	Staff agrees with this comment. The RG will be revised to incorporate the changes.
	C Regulatory Position, part (7)	<p>Comment:            Delete entire Subsection 7 and replace with language existing in Subsection 8:            "Annexes A, B, C, D, G, H, J, K, L and M are informative and provide optional test methods. Unless otherwise stated in a regulatory position, endorsement of IEEE 450-2002 does not include these annexes."</p>	Staff agrees with this comment. The RG will be revised to incorporate the changes.
	C Regulatory Position, part (8)	<p>Comment:            "These annexes are required to support the periodic inspections and tests of Clause 5 and must be endorsed."            Proposed Alternate:            Rewrite Subsection 8 to read as follows:            "Informative Annexes E and F provide visual inspection and intercell connection resistance inspection and test methods and are specifically endorsed as part of IEEE 450-2002."</p>	Staff agrees with this comment. The RG will be revised to incorporate the changes.
Richard Bolgeo, Chairman of IEEE	Comment 1	DG-1155, Page 4, Paragraph 4 states: "In addition, IEEE Std 450-2002 introduces the	Staff agrees with this comment. The RG will be revised to incorporate the changes.

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Standard 450-2002		<p>practice of allowing users to transition from correcting for temperature before conducting the discharge test to correcting for temperature after conducting the discharge tests. However, the standard does not provide any supportive information to evaluate the impact of this practice."</p> <p>This paragraph is incorrect. IEEE Standards 450-1972 and 1975 both contained constant current and time base corrected tests in which the time duration of the test was corrected after the completion of the test. In 1987, IEEE Standard 450 was issued that eliminated that reference to that type of test. It is my understanding that at that time, the IEEE was trying to align its standards with those produced in Europe that cover the same areas. During that time period, Europeans used current rate adjusted testing versus the constant current testing in the United States. Since that time however, the United States has stayed with constant current and time base corrected tests because of their ease of use, repeatability, and accuracy.</p> <p>While drafting IEEE Standard 450-200, it was determined that all manufacturers agreed that both types of testing methods, Rate Adjusted and Constant Current, were valid for times 1 hour or greater. Also, to improve the accuracy of both tests, new K factors were calculated, approved by the</p>	

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		<p>manufacturers, and incorporated into IEEE Standard 450-2002.</p> <p>Therefore, temperature correction of time for a Constant Current Discharge Rate Capacity Test had been around since the first version of IEEE Standard 450 and is more accurate today than it was originally.</p>	
	Comment 2	<p>DG-1 155, Page 5, Item 2 states: "2.Subsection 5.2, "Inspections," should be supplemented with the following: "For nuclear power generating station Class <b>1E</b> batteries,battery float current and voltage should be measured and recorded weekly."</p> <p>IEEE 450-2002, section 5.2.1 specifies that these two type of inspections, battery float current and voltage, should be performed monthly. However because of the nature of safety concerns in US nuclear plants, this surpra-compliance of the IEEE document could be deemed prudent and would be acceptable.</p>	Staff agrees with this comment. No changes are required.
	Comment 3	<p>DG-1 155, Page 5, Item 3, Subsection 5.4.1 (d) states: "(d) For nuclear power generating station Class 1E batteries, the use of stabilized charging current to determine a fully charged condition should (1) be limited to lead-calcium batteries and (2) verified by measurements during charging ... "</p> <p>This statement recognizes the difference in</p>	Staff agrees with this comment. No changes are required.

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		<p>technologies between lead-calcium batteries and other types and is technically accurate. Therefore, this recognition could be deemed to be prudent and would be acceptable.</p>	
	<p>Comment 4</p>	<p>DG-1155, Page 5, Item 5, states: "In Subsection 6.1, "Acceptance test," a second sentence should be added to state as follows: "However, a test of the battery's capability (see 7.5) shall be made upon initial installation.""</p> <p>There is no technical basis for this change. IEEE Standard 450-1972,1975,1987,1995 and 2002 are all in agreement with this issue in that if an acceptance test is performed at the manufacturers, then it is not necessary to perform this test upon initial installation of the battery. See Section 6.1, paragraph 1 of IEEE Standard 450-2002.</p> <p>The user has 2 years to test the newly installed battery by a Performance Test (or a Modified Performance Test) in accordance with section 6.2(a) of IEEE Standard 450-2002 after the battery has been installed.</p> <p>Since the advent of IEEE Standard 450-1972, this has been the recommended method and through out the past 4 reviews, no changes have been approved in the IEEE Standard 450 documents. Numerous</p>	<p>Staff disagrees with this comment. Before the battery is in operation, its capacity and capability should be tested in the new configuration for performing the safety function (as consistent with IEEE Std 338). See comment C Regulatory Position, part (5) from Mr. Mark S. Clark. No changes are required.</p>

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		<p>times when this issue was brought up by the NRC representative, we have asked for documented evidence from the committee as a whole that we can review, that would show where our recommendations in this case are lacking. <b>At no time has anyone presented any evidence to prove the case for the need to change this recommendation. This proposed requirement has not been shown that have any technical merit.</b></p> <p>A review of DG-1155 shows no technical basis for this change for this recommendation presented in IEEE Standard 450-1972, 1975, 1987, 1995 and 2002. Also, for some nuclear plants that are limited on outage times, this change will cause a significant problem and could cause extended and unnecessary outages.</p> <p>Therefore, I find this recommended change to be imprudent, not supported by engineering data and unacceptable.</p>	
	Comment 5	<p>DG-1 155, Page 6, Item 7, states: "In Subsection 7.2.2, "Discharge Rate," the last paragraph allows users to transition from correcting for temperature <i>before</i> conducting the discharge test to correcting for temperature after conducting the discharge test. This statement should be supplemented with the following: "For nuclear power generating station Class IE batteries, the preferred method is to adjust</p>	<p>Staff agrees with this comment. The RG will be revised to incorporate the changes.</p>

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		<p>the discharge rate for the time-adjusted method for temperature before conducting the test..”“</p> <p>See the Comment 1 for the technical discussion.</p> <p>DG-1155 is requiring a change to the test methodology of all types of capacity tests specified in IEEE Standard 450-2002 without giving any technical reasons other than the incorrect assumption put forth in DG-1155, Page 4, Paragraph 4.</p> <p><b><u>Therefore, I find this recommended change to be imprudent, not supported by engineering data and unacceptable.</u></b></p>	