NEI
NUCLEAR ENERGY INSTITUTE

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73 FR 53452

James H. Riley
DIRECTOR
ENGINEERING
NUCLEAR GENERATION DIVISION

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(2)

Mr. Michael T. Lesar
Chief, Rulemaking, Directives, and Editing Branch
Office of Administration
U.S. Nuclear Regulatory Commission
Mail Stop T-6D59
Washington, DC 20555–0001

Subject: Federal Register Notice of the Availability of a Draft "Project Plan – Fire Induced Failure Models and Effects Testing of Direct Current Driven Control Cables," for Public Comment.

Project Number: 689

Dear Mr. Lesar

The Nuclear Energy Institute (NEI) [1], on behalf of the nuclear industry, is submitting comments to *Federal Register* notice 73 FR 53452: a notice of the availability of the draft "Project Plan – Fire Induced Failure Models and Effects Testing of Direct Current Driven Control Cables," and a request for public comment.

NEI's comments can be found in the enclosure; however, our two primary comments are as follows:

1. Post-test analysis should include the data in support of two factors:
   a. Hot short probability for various configurations (cable type, fuse size, component type), and
   b. Hot short duration for various configurations.

   Since the purpose of the test is to look at these factors, the test report should, at a minimum, provide a statistical summary of these factors.

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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1776 I Street, NW | Suite 400 | Washington, DC | 20006-3708 | P: 202.739.8137 | F: 202. 533.0193 | jhr@nei.org | www.nei.org

Template - ADM-013 Add = G. Taylor (GJT)

2. The DC battery bank described in the document does not adequately represent the possible fault current capabilities of a typical station battery. Using the IEEE 946 methodologies, the charger plays a key role during the first couple of microseconds of a DC fault. There are three stages that must be considered. The capacitor discharge, the charger clamp on output current and the current delivered from the batteries. Typical station batteries can deliver three to four thousand amps of fault current. Some larger systems can deliver up to 10,000 amps.

   The combination of large fuse size and undersized battery banks will provide gross over estimation of fault durations. Either the battery capacity needs to be increased or the fuse size and associated clearing time needs to be scaled back to align with the reduced fault current capability of the test device.

We appreciate the opportunity to comment on the draft document. If you have any questions regarding this effort, please contact me at (202) 739-8137; jhr@nei.org or Steven Hutchins at (202) 739-8025; sph@nei.org .

Sincerely,

James H. Riley

Enclosure

c: Mr. William E. Kemper, NRR/ADES/DE/EICB, NRC
Mr. Satish K. Aggarwal, RES/DE/MEEB, NRC
Mr. Stephen C. O'Connor, RES/DE/RGDB, NRC
NRC Document Control Desk

ENCLOSURE

Comments on Project Plan for Fire-Induced Failure Modes and Effects Testing of Direct Current Driven Control Circuit Cables
Project Plan Dated September 10, 2008 (ADAMS Accession No. ML082520518)

Item	Section	Comment	Characterization
1	General Comment	Post-Test Analysis should include an analysis of the data in support of two factors: a) Hot Short Probability for various configurations (Cable type, Fuse size, Component Type), and b) Hot Short Duration for various configurations. Since the purpose of the test is to look at these factors, the test report should at a minimum provide a statistical summary of these factors.	Comment
2	General Comment	Testing of Smoke should be delayed. The proposed testing provides little value, and will only distract from the main testing being performed. NUREG/CR-6850 indicates that the impact on most components due to smoke is likely unimportant (generally). Although it would be nice to verify this, the type of testing required to determine the impact of smoke on relays, electrical component, etc. is much more extensive than the effort being inserted in this testing.	Comment
3	General Comment	There are several plants with GE Vulkene (EQ variety) cable (Thermoset insulator w/ Thermoplastic jacket). NEI has requested the Industry to provide EPRI with a representative sample of cables current in use at Plants. One note of interest; however, is that GE sold two kinds of Vulkene, one with TS insulation and one with TP insulation. Nuclear Plants used the TS variety because it passed the IEEE-323 EQ testing requirements	Comment
4	General Comment	It is recommended to include some testing of grounded circuits (with equivalent ungrounded circuits) to determine the impact of grounding the DC power supply on Hot Short Probability and Duration. Duke testing indicated that grounding the circuit would reduce the probability of HS tremendously, but this testing was on armored cable and would not be applicable to non-armored cable. Include in the testing the impact of multiple circuits from the same source, such that the impact of the first ground on one circuit results in the proper effect on the other circuits. The effects of grounds on a single circuit should represent the typical design of DC circuit components in operating nuclear plants.	Comment
5	2.1 (Page 8)	Fuses in DC circuits are not "significantly" larger. They are sized to protect the wire, but remain coordinated with the other fuses / breakers in the distribution system.	Comment

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Item	Section	Comment	Characterization
6	2.1 (Page 9)	While it is true that on an ungrounded DC System, no single ground would trigger circuit over-current protection, it is also true that no single ground would cause a spurious actuation, as there is no return path for the current. Typical station batteries are ungrounded with ground detection system at the DC bus. A test configuration with a typical ground detection system will test if a solenoid valve will energize due to a single ground. CPT Fuses are sized to protect the CPT and as such, are much smaller by design.	Clarification
7	4.1 (Page 24)	The DC Battery Bank described in the document does not adequately represent the possible fault current capabilities of a typical Plant Battery. Using IEEE 946, the charger plays a key role during the first couple of microseconds during a DC fault. There are three stages that must be considered. The capacitor discharge, the charger clamp on output current and the current delivered from the batteries. Typical Station Batteries can deliver 3-4 thousand amps of fault current. Some larger systems up to 10,000 amps. The combination of large fuse size and undersized battery banks will provide gross over estimation of fault durations. Either the battery capacity needs to be increased or the fuse size and associated clearing time needs to be scaled back to align with the reduced fault current capability of the test device. Additionally, typical Station Battery Systems are run at a float voltage level of 130 – 132 volts DC.	Technical Adequacy
8	4.2.1 (Page 25)	The vast majority of instrument loops are either 0-5 volts or 4-20 milliamps, not 125VDC. The DC is used to supply power to the rack. While the actual test is described as a 4-20 mA instrument loop, this paragraph indicates a 125VDC instrument loop.	Technical Adequacy
9	4.2.2	Inter-cable hot shorts are an important phenomena to understand. The cables being tested are all "intra-cable" hot short candidates. The specific configurations for inter-cable hot shorts, when developed, should be provided to the public for review and comment.	Missing information

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10	Appendices	The circuits under consideration in these tests are of different configurations than those tested in EPRI/NEI, CAROLFIRE, and Duke, which essentially tested MOV circuitry. In order to gain an understanding of the likelihood in post-data processing, the specific spurious operation of concern should be specified in the test. For example, the "4kv breaker simulates a pump that is off, and the data collected should be geared towards hot short induced spurious starts of the pump i.e., breaker closure". The same criteria could be used for the SOVs and DC MOV. This will ensure that the contact (switch) alignments at the start of test have a position that reflects the pre-fire state and that specific conductor-to-conductor interactions can be reviewed post-testing and that, eventually, likelihood numbers can be estimated. There seems to be no discussion regarding getting proper polarity to actuate the end device. DC devices have a polarity that must be met to actuate them (unless they were built with integral rectifiers).	Clarification
11	Typos	p. 28 2nd para., "In contract..." should be "In contrast..." p. 42 1st para. "...motor started..." should be "...motor starter"	Editorial
12	Appendices	Appendix B addresses testing of an AC circuit to better understand the influence of CPTs. There are references to "DC circuit tests" in this section that appears confusing when read. Recommend calling this section "AC MOV Circuit Testing conducted as part of the DC Circuit Test Program" or words to that effect.	Editorial

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13	Appendix C	The switch arrangement for the DC MOV (simulating the position switch) "hard wires" the green indicating light as part of the test configuration, rather than changing the state as the valve position changes if subjected to spurious operation. This is different than the DCCCS setup for the SOV configurations in Appendices E, F, and G, which use contacts driven by the solenoid to close and open position switch contacts. This type of clarification should be described in the test plan, since it limits the types of failures that may be experienced during the test and could eventually lead to mischaracterization of likelihood numbers if not understood by the post-testing analysts. (e.g., the R wire to the red indicating light in Figure 9 will never be energized unless subject to a hot short.....in a fire that changes valve positions or if the component started in a different position the R wire could be energized and be a "hot short source"	Clarification
14	Appendix D	Recommend including the "big picture" switchgear discussion before the detailed "anti-pumping feature" rather than after, since it prevents an additional level of discussion beyond the switchgear discussion.	Editorial
15	Appendix E	Recommend removing the XK contact from the Circuit or showing as a normally closed contact. The NUREG/CR-6850 example showed contact XK in the closed position, which it should be in to reflect the DCCCS figure 18 of the test plan. By showing the XK contact as open, the circuit failure mode (S2 to S3) would have no effect. However figure 18 depicts that an S2 to S3 intracable hot short would energize the SOV.	Technical accuracy
16	Appendix H	Except for a 10 second time period (trip of Offsite Power and start of the EDG) the battery charger is connected to the DC Distribution System and helps to shape the size and duration of the fault current.	Technical accuracy
17	Appendix G	For the Instrumentation Circuit Test Configuration, it is not clear about the size of the cable conductors. Instrumentation circuits are typically 2 conductors, #16 AWG, twisted shielded pairs. The test configuration addresses shield treatment and shows two conductors, but not the size.	Technical accuracy

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18	Appendices	Recommend showing position switch contacts as normally open or normally closed. This is done inconsistently in the Figures for SOVs and MOVs in the Appendices. For consistency, it is recommended that they are shown in the state reflecting the assumed component position and that this method is clearly stated, since it defines the DCCCS switch positions and may ultimately affect the post-testing analysis and estimation of likelihood numbers.	Clarification
19	Appendices	In general the cable under consideration (in the DCCCS discussions in the Appendices) could be described more clearly and annotated more clearly in the Figures. In some instances, the cable being tested is listed, in others (Appendix D, switchgear breaker testing) the cable being tested is not annotated. Highlighting the cable under consideration in the test plan and final report will provide the readers with a clear picture and greater correlation between the elementary diagram, block diagram, and DCCCS figure.	Editorial, Document improvement
20	Appendices	When printed in black and white, the DCCCS figures become more difficult to interpret. This could lead to misinterpretation of the DCCCS setup (e.g., the boundaries of the DCCCS may not appear shaded and may lead to misinterpretation as a current path. While color improves the document, the document should "stand alone" if printed in black and white.	Editorial. Document improvement.