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(2)

November 13, 1996
MP3-DE-96-818

Mr. Curtis F. Nelson
Sandia National Laboratories
Albuquerque, NM 87185

Subject: Draft Report NUREG/CR-6412, *Aging and Loss-of -Coolant Accident (LOCA) Testing of Electrical Connections*

Attachment: Comments to subject report

Dear Mr. Nelson:

We at Northeast Utilities Millstone Unit 3 have received a copy of your draft report as a member of the Nuclear Utility Group on Equipment Qualification. It is apparent from the wealth of data retrieved from the test that the test was very carefully thought out and executed. It is especially noted that you have employed a novel approach to baseline pre-steam and post-steam test configuration impedance characteristics by using Time Domain Reflectometry (TDR). We believe that this approach provides excellent insight into the performance dynamics of the test specimens as well as the entire test setup.

We appreciate the opportunity to comment on this draft report before final issue. Attached to this letter are our comments. Hopefully our comments may add to this document by identifying areas of improvement which could alleviate any misleading or misunderstanding of the results of this report. Should you have any questions regarding our comments please do not hesitate to contact W.J. (Budd) Hayes (860) 447-1791 extension 6702 or e-mail him through the internet at HayesWJ@GWSMPT.NU.com.

Best regards,

Robert A. Andren
Millstone Unit 3 Design Engineering Manager

wjh/

c: Paul Grossman, Millstone 3 Engineering Director
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1. With regard to the 1.15 activation energy, some test specimens were under aged and many were over aged by quite some margin over the 60 year objective. A listing for each test specimen should be provided as to its equivalent temperature aged life at 55°C for comparison to the 60 year objective. This needs to be factored into the discussion of the results, i.e. could over aging have been a factor in some of the poorer evaluation tests results or in some cases could under aging have contributed to better results.

2. It is not clear how the cables going into and out of the test chamber were sealed at the test chamber wall, e.g. were they potted, or compressed, etc. This may be a very relevant concern as questions regarding the Time Domain Reflectometry (TDR) data and the lack of its evaluation are identified. Could electrical degradation have occurred at the point where cables entered and/or exited the test chamber (See comment 5)? It may be very misleading to state for example on page 43 that certain test specimens had low IRs when the low IRs may be due to other parts of the circuit instead of the test specimens themselves.

3. It is not clear on the manner of steam entrance into the test chamber during the LOCA simulation. The steam appears to enter the test chamber from the top of the test chamber just as the cables enter and exit the test chamber. Was there a steam baffle to distribute the steam as it entered the test chamber? Was there direct steam impingement on the test items and cabling? If so, this may be contrary to some of the manufacturers recommendations and should be identified. For example Kapton insulation is not recommended to be placed in such a situation and may explain the blown fuses encountered for the Conax ECSA during the LOCA test. In this case it may be misleading to identify to product as "failed" instead of the test setup.

4. Visual observations post LOCA were not identified. There was no mention if the "device enclosures" had moisture inside of them when they were opened. There was no mention of the condition of the tested equipment after the test. This type of information should be provided and evaluated.

5. It is refreshing to see "state of the art"/new methods used to provide additional data which provide insight into what may have actually happened during a test. It appears as if the TDR provides this type of information. However, this TDR data was provided in an unevaluated manner. There should be an evaluation/analysis of the data with specific correlation to the test specimen and its performance during the LOCA test and other post test results.

   a. For example, for the 60ft cable test specimens, the test specimen would be located at the 30ft mark. If there were indications of potential problems with the test specimen, then there may appear a negative ρ spike, at the 30ft mark indicative of potential or actual shorting to ground. From Figures B.1, B.3, and others, the negative ρ spikes are at the 60ft mark and would be indicative of a problem at the test chamber wall rather than at the test specimen. This needs to be explained.

b. For example, for the conduit seal, Figure B.2 a 30ft sample, the negative ρ spike is at the 5ft mark also indicative of test chamber wall area rather than test specimen.

c. As another example, examining Figure B.6, a 30ft sample, there is definitely a change between the pre and post steam TDR curves. The post-steam curve shows a marked tendency toward short-circuit in the 20 to 30 foot section of the curve which could indicate the test specimen rather than the connecting cable. This data should be correlated with the performance of the test specimen during the LOCA test and other post tests data and also followed up with visual observation as to whether or not moisture was notice in the device enclosure.

As identified in comment 2 and in this comment, there may be results identified in the present draft report that may be misleading as to the performance of the actual test specimen. Some performance or lack of performance indicators may be as a results of the test set-up rather than the test specimen. Only through identification and evaluation of all of the test data can such be accurately disseminated.