Entergy
Operations

Entergy Operations, Inc.
Route 3 Box 137G
Russellville, AR 72801
Tel 501-964-3100

August 20, 1993

2CAN089304

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Electrical Penetration Overcurrent Protection

Gentlemen:

During the Electrical Distribution System Functional Inspection (EDSFI) at Arkansas Nuclear One - Unit 2 (ANO-2) conducted May 4 through June 5, 1992, the NRC inspection team identified a concern regarding the coordination of containment penetration overcurrent protection devices. Following a review of the design calculation, the Staff identified several circuits that appeared to be unprotected from low energy overload conditions. In the safety evaluation issued June 18, 1992, the Staff recommended that appropriate actions be taken to ensure ANO-2 complies with the criteria of IEEE Standard 308-1971 and Regulatory Guide 1.63. In letter dated September 4, 1992, the ANO-2 response was submitted including a table of containment penetration circuits for which the protective device trip curves intersect the extrapolated 250°C conductor damage curves in the overload region. The damage curves used were generated from values provided in IEEE 317-1983, Table A5 and are only applicable for short periods of time (2 seconds per IEEE 317-1983, ~ 10 seconds per IEEE 242-1986.) In accordance with the licensing basis, these curves illustrate that ANO-2 electrical penetrations are protected against the maximum possible fault current by both primary and backup protective devices for each circuit.

On February 26, 1993, the Staff issued a request for additional information (RAI) to resolve this issue. Upon our evaluation, it was determined that some of the information requested was outside the ANO-2 licensing basis and was not readily available. Alternatives for resolving this issue were discussed with the Staff in a subsequent telephone conference. The results of that discussion are documented in correspondence to the NRC dated April 30, 1993 (2CAN049305.) The agreed upon information and the ANO-2 responses to the NRC concerns are contained in Attachment 1.

A001
1/1

Attachment 2 provides the revised reactor building penetration protection calculation (Calc. 85-E-0118-01.) The cable intermediate characteristics methodology in Appendix IV of the calculation determines a single conductor cable maximum safe overload capability from 10 seconds to 1000 seconds. This evaluation was developed in accordance with the guidance provided in Section 8.5.2.4 of IEEE Standard 242-1986. From the revised figures in Appendix II of Attachment 2, it is shown that the cable intermediate characteristic curves for the penetration circuits do not intersect the protective device trip curves in the overload region. These results indicate that the penetration circuits are protected from damage in the overload regions by at least one of the protection devices credited in the Technical Specifications. Should you have further questions regarding attached information, please contact me.

Very truly yours,

for James J. Fisicaro
Director, Licensing

JJF/dbm

Attachments

cc: Mr. James L. Milhoan
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One - ANO-1 & 2
Number 1, Nuclear Plant Road
Russellville, AR 72801

Mr. Roby B. Bevan, Jr.
NRR Project Manager Region IV/ANO-1
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Mr. Thomas W. Alexion
NRR Project Manager, Region IV/ANO-2
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Electrical Penetration Overcurrent Protection
Request for Additional Information

1. A conductor based evaluation will be performed using a conservative conductor size to develop conductor capability curves in the overload range.

   ANO-2 Response: Revision 2 to Calculation 85-E-0118-01 (Attachment 2) incorporates a conductor based evaluation of the intermediate (10-1000 second) overload capabilities of ANO-2 reactor building electrical penetration modules. The evaluation, developed in accordance with IEEE 242-1986 and discussed in Appendix IV, indicates the cable intermediate characteristic curves do not intersect the protective device trip curves in the overload range (Figures 1 through 42, Appendix II.) This revised evaluation takes into account the conductor's ability to dissipate heat and is based on the most limiting element of the penetration circuit, the pigtail conductors. The previous evaluation under revision 1 of the calculation, extrapolated the 250°C damage curves beyond the applicable range. For some circuits, the extrapolated portion of the curve formed an intersection with the protective device curves and an apparent susceptibility to overcurrent conditions in the intermediate range. However, the attached revised calculation shows that these circuits are protected against overcurrent conditions in the intermediate (10 - 1000 second) region.

2. The reactor building penetration protection calculation (Calc. 85-E0118-01) will be modified to remove the penetration protection figures which are not being utilized for any ANO-2 applications.

   ANO-2 Response: The figures that are not applicable to electrical penetration circuits installed in ANO-2 have been removed. See Appendix II of Attachment 2.

3. A figure will be added to the penetration protection calculation to show that the fuse curve utilized to evaluate the penetration circuit protection envelopes the worst case fuse application.

   ANO-2 Response: The figures in Appendix II of Attachment 2 have been developed to compare the time/current curves for fuses that are used in various control panels at ANO and are available in ANO's stockroom. Per our conversation on April 30, 1993, a note has been added to indicate that the worst case fuse has been used for the figures in Appendix II when the actual fuse type in use has not specifically been identified. This approach ensures that where the installed fuse type is not specifically identified, the circuit is evaluated assuming the most limiting time/current fuse curve, and that the circuit is protected regardless of the fuse type installed. See Section 4.3.2.

4. Expand the penetration table previously provided in our September 4, 1992 submittal to include the remaining penetrations where protection is not provided for the full conductor capability curve.

   ANO-2 Response: The penetration table provided in our September 4, 1992 submittal listed the penetrations for which the conductor damage curve intersected the protective device trip curve in the overload region. Based on the revised approach taken in accordance with IEEE 242-1986, these curves no longer intersect in the overload region for ANO-2 penetration circuits. Therefore, the penetration table has been omitted.

ATTACHMENT 2

TO

2CAN089304