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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Results of Independent Analysis
of Anomalous SPDS Isolation Device

Gentlemen:

NRC letter dated July 31, 1989 (ØCNA78925) transmitted the staff's Safety Evaluation (SE) regarding the SPDS isolation devices, and concluded that the isolation devices were properly tested and acceptable for use in the ANO SPDS. The SE was issued after the staff's review of our submittal of test results (provided by letter dated February 28, 1989, ØCANØ289Ø7) for the Rochester Instrument Systems (RIS) Model SC-1302 isolation device. Testing of this specific model of isolator was conducted in response to NRC requests. The SE acceptance was based on our commitment to inform the NRC in writing of the results of the independent analysis which was performed to verify our suspicion that the performance anomalies of one of the devices during testing were attributable to a defective component rather than an inherent design deficiency. Our schedule for submittal of these results was communicated by our letter dated November 7, 1989 (ØCAN118909). This independent analysis was recently completed, and determined that the specific isolation device's anomalous behavior was a result of its different circuit configuration. The analysis also confirmed that the RIS Model SC-1302 isolator maintained proper electrical isolation (as required by IEEE Standards for Class 1E and non-Class 1E circuitry interfaces) even under maximum credible fault test conditions which significantly exceed normal operating conditions.

As mentioned above, the purpose of the independent analysis (performed by NAS Inc.) was to determine the root cause of the functional anomaly, i.e., a significant increase in input power current draw, of one specific unit (Serial Number 78407-19) observed after the Maximum Credible Fault (MCF) test performed in 1989 at National Technical Systems laboratories. This unit was one of four units subjected to the MCF test and the only one exhibiting the above noted anomaly.

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The failure analysis study included visual examination, voltage and current measurements, circuit analysis, and functional tests of the four test units and one good (comparison) unit identical to S/N 78407-19. Failure analysis results indicate that the test unit S/N 78407-19 failed in a manner that was different from the other three test units due to its different design configuration. The major difference between S/N 78407-19 and other test units was that for the S/N 78407-19 design a resistive parallel signal path shunts certain transistors so that less current passes through these transistors so they are not completely destroyed (open circuit) during the MCF test as is the case in other units. This resulted in component failures in the power supply circuit which eventually led to the increased power consumption. In the other test units the complete destruction (open circuit) of these transistors or other devices prevented further propagation of the high voltage signal, which terminated the transient. This design; however, includes an internal fuse installed at the input of the power supply circuit. The fuses were removed and shorted as part of the original testing to examine circuit fault effects. This fuse, had it not been removed and replaced with a solid wire (shorted) prior to the MCF test, would have protected the input power circuit from excessive current draw. Based on the results of the failure analysis study summarized above, we conclude that a unit of the same design configuration (parallel resistive shunt path) would have exhibited a similar increase in current draw, which would be limited by the internal fuse which is in all units of the same design as S/N 78407-19. Suitable isolation is provided by both isolator designs.

As discussed in the staff's SE transmittal letter referenced above, closure of the SPDS review issue has been superceded by the issuance of Generic Letter (GL) 89-06. Our responses to GL 89-06 were provided by letters dated July 17, 1989 (ØCANØ789Ø7) and September 26, 1989 (ØCANØ989Ø4), which reiterated our position that the ANO SPDS meets the requirements of NUREG-0737 Supplement 1. We also committed to notify the NRC if our detailed review of the ANO SPDS considering the information in NUREG-1342 identified any significant findings which would alter our compliance with the SPDS requirements. Although this review is not yet complete, it is well underway and no such findings have been identified to date.

A three member team of the NRC Human Factors Analysis Branch visited ANO on February 7 and 8, 1990 for an audit of the ANO SPDS. Although we have not received the team's evaluation report, the team stated at the exit meeting that the ANO SPDS fully met the requirements of NUREG-0737 Supplement 1. The NRC team members also commended our detailed review of the ANO SPDS considering the information in NUREG-1342. It is our understanding that the NRC's review of the ANO SPDS is now completed, and that transmittal of the results of the recent NRC SPDS audit will represent closure of the issue.

If you have any questions on this matter, please do not hesitate to contact me.

Very truly yours,

James J. Fisicaro

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JJF/RBT

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