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U. S. Nuclear Regulatory Commission
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ATTN: Mr. Craig Harbuck, NRR Project Manager
NRR Mail Stop 13-D-18

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Containment Temperature JCO
Follow-up - Error Calculations

Dear Mr. Harbuck:

The attached information is a follow-up to the ANO-1 August 27, 1987 ANO-1 Reactor Building Temperature JCO submittal (1CAN088707). Arkansas Power and Light Company (AP&L) was requested in a conference call with the NRC Staff to provide additional information on error calculations used to access the effects of the elevated temperatures on protection system setpoints. Specifically, the NRC Staff was concerned on those loop errors of the RPS where the error combination method had been changed from the former linear (addition) method to the statistical (square root sum of the square (S[illegible]S)) methods, and if AP&L had properly considered non-random errors.

Very truly yours,

Dan R. Howard
Manager, Licensing

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Attachment

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On many of the ANO-1 protective system loops, a combined linear/SRSS method is employed. Under this method the individual error effects of a device are combined by SRSS to establish the device error. Next, each of the device errors in the loop are combined by linear methods based on a mathematical expression defining the function of the loop. This is generally more conservative than applying SRSS methodology to the loop as well as the device. In the past AP&L has applied the SRSS methodology to the device and the loop for the ESAS reactor coolant pressure transmitters. This was formally approved by the NRC in Amendment 108 to ANO-1 Operating License DPR-51 (1CNAØ787Ø9) dated July 24, 1987 in which the HPI/LPI setpoint was revised. The SRSS methodology is also employed in the flow portion of RPS Power/Imbalance/Flow Trip and the EFIC trip/actuation functions.

The particular question raised by the NRC Staff in the conference call centered around the Hi/Lo Reactor Coolant Pressure RPS trip as discussed in the JCO. AP&L instructed B&W to evaluate the elevated temperature effects on accuracy and setpoints using the old methodology and also using total SRSS methodology. This was done assuming a justification for acceptability may have to be based on the total SRSS method if the former linear method produced unacceptable results. The old methodology was applied at the JCO profile temperature of 130°F corresponding to the installed locations of the transmitters. The SRSS calculation was done at 150°F, considering a conservative 20°F margin. In switching to the newer SRSS method, all device errors were assumed random in the calculation. This was considered adequate at the time the JCO calculations were prepared due to the assumed temperature margin. Both the linear and SRSS methods produced acceptable and conservative results with respect to the limits prescribed in ANO-1 Technical Specifications Table 2.3-1.

Later calculations using the SRSS method with the non-random errors linearly added resulted in allowable technical specification setpoints for the high pressure trip at 2361.23 PSIG and low pressure trip at 1794.77 PSIG based on a loop equipment error of 28.77 PSI at 130°F. Using the more conservative 150°F temperature, the allowable technical specification setpoints become 2357.44 PSIG and 1798.56 PSIG respectively based on a loop equipment error of 32.56 PSIG. These setpoints are acceptable and conservative with respect to the limits prescribed in ANO-1 Technical Specifications Table 2.3-1.

A rather large process error accounted for in the setpoint determination is the pressure drop from the core outlet to the point of pressure measurement along the hotleg piping. This process error is non-random and was still treated as such when the methodology was changed. In other words, it was algebraically added to the SRSS combination of the random errors.

For all error combination methods described previously, the trip setpoints were found to be conservative.