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September 12, 1983

2CANØ983Ø6

Director of Nuclear Reactor Regulation
ATTN: Mr. James R. Miller, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Responses to ANO-2 ICC Safety
Evaluation Questions

Gentlemen:

Your letter dated August 9, 1983, (2CNAØ883Ø2) requested responses to questions raised during the evaluation of our April 15, 1983, (2CANØ483Ø6) and May 4, 1983, (ØCANØ583Ø1) responses regarding our proposed Inadequate Core Cooling (ICC) instrumentation systems.

Complete responses to certain questions will require additional progress in our design and confirmatory testing efforts; other questions can be answered at this time. Attached is a discussion of each question and a commitment for a future response, if required.

Very truly yours,

John R. Marshall
Manager, Licensing

JRM:JK:sl

Enclosure

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ATTACHMENT 1

1. Provide a detailed analysis of the measurement errors in the coolant inventory measurement. This analysis should include, besides the overall estimate of the measurement uncertainty, a table with estimates of error, including limits of uncertainty for each contributing factor, i.e., uncertainties associated with the transducer, signal processing, etc. Explain how the individual errors were combined for the estimate of the overall error. Express the uncertainties in inventory measurement because of the use of discrete sensors as a percentage fraction of the coolant system volume.

   Response

   A detailed analysis of the measurement errors of the proposed level instruments is not available at this time. To perform this analysis it is necessary to know detailed information about each component that comprises the measurement string. The individual error components are then combined by a method determined by the nature of the errors. If the errors are random, they may be combined using a statistical technique. The root-mean-square method is generally accepted in this case. If the individual errors are not random, the components must be algebraically added to allow for the worst case. This information will be available after the confirmatory testing is finished and will be submitted with the final design description, currently scheduled for March 1985.

2. How many sensors are connected by a single heater lead? What is the heat source for the heater?

   Response

   A gamma thermometer probe of the type proposed for the ICC instrumentation system will consist of multiple sensors in a single rod. Each probe will contain a single segmented heater wire with an electrical heat source. At points along the length of the probe where heating is desired, a high resistance segment (possibly nichrome) is employed. The interconnecting segments will be a low resistance material providing a continuous path for the heater current. The heater will be operated at a power level well below its design rating. This fact, plus the technique of heater fabrication, makes the heater quite reliable. The exact number of sensors per rod and the details of the heater power supply will be submitted with the final design description.

3. Are the elevations of the sensors shown in Figure 1 approximately correct?

   Response

   Figure 1 of our April 15, 1983 submittal (2CAN048306) is conceptual. Although the actual number of sensors and their locations have not been finalized, the figures are representative of the design concept. The goal of the final design will be to locate a sufficient number of sensors to provide the operator with the best information possible,

both above the core as well as in the core. The exact number and location of the sensors will be submitted with the final design description.

4. Discuss the methods proposed for fault and/or failure detection. For instance, will the control electronics include open circuit detection? How will failures be indicated to the operator?

Response

The exact method to be used for failure detection in the ICC instrumentation system has not yet been determined. Providing an indication of failure to the operator will be an important consideration in the final system design. Failure detection methods will be submitted with the final design description.

5. Describe the location of an indication of the state of the reactor pumps with respect to the location of the inventory readouts.

Response

The SPDS computer will be used to provide the primary ICC display. Presently, a SPDS display CRT is located in the control room. The exact location may be subject to change pending the results of the control room design review. Although the display format for the inventory display has not been developed yet, the SPDS provides a great deal of flexibility in giving the operators clear, concise information. The color graphic capabilities of the SPDS will be used. The RCP status can be input to the SPDS in order to clearly mark those portions of the inventory readout which are not valid during pump operation. Location and ICC display information will be submitted with the final design description.

6. Describe how the plenum level indication will be indicated invalid when the coolant pumps are on.

Response

See response to question 5.

7. The CET system, which will not be upgraded before 1987 according to the licensee submittal, has electrical connectors within containment which are not qualified. Provide details concerning the design of these connectors to address our concern that they will not survive the adverse environments which may be associated with accidents requiring the use of CETs for monitoring of ICC. Confirm also the type and expected environmental design capability of the existing thermocouple cable inside containment. Evaluate the feasibility and schedule limitations for early upgrading of 16 of these electrical connectors (associated with 4 thermocouples per core quadrant).

Response

The connectors utilized for the in-core instruments (ICI) in ANO-2 are Gulton (at the reactor head) and Bendix on the refueling maintenance structure. The (ICI) cable utilized inside containment was

manufactured by Raychem. This cable and associated connectors was procured as prefabicated cable assemblies. The procurement specification for the prefabicated cable assemblies requires the ICI cable assemblies to be class IE. As indicated in our April 15, 1983, submittal (2CANØ483Ø6) the cable is routed in channellized raceways from the reactor vessel to the electrical penetrations at the reactor building wall. Research into existing documentation indicates that sufficient qualification may, in fact, currently exist for the connectors and cable and further testing may not be necessary. We will provide additional information on this item by November 4, 1983.

8. The display (plant computer) currently in use for core exit thermocouples is not Class 1E. Until a Class 1E backup display is installed, the licensee should provide an alternate and diverse highly reliable backup means of reading core exit temperature. Evaluate your existing capability and propose a plan and schedule for early implementation of such capability if it does not exist.

Response

Presently, the 44 Core Exit Thermocouples (CET) signals are input to the plant computer. In order to provide an alternate and diverse backup means of reading core exit temperature, AP&L will transfer 22 of the CET signals to the SPDS computer during the third refueling outage which is scheduled to begin around November 1, 1983. When the new Class 1E backup display is installed, all 44 CET signals will be input to the SPDS computer system (primary display) and will be removed from the plant computer.

9. Provide the details of the control room information display available to the operator for the existing CET system, particularly regarding readout ranges, alarm arrangements, and trending capability.

Response

The control room displays for the CET system is currently via the plant computer. The operators can access any of the CET inputs from the plant computer operator console. The readout is a digital readou from 0-2300°F. In addition, each signal can be trended individually o within a group. After the third refueling outage, 22 of the CET signals will be displayed on the SPDS computer system. The SPDS computer will provide a color graphic mimic of the reactor core indicating the CET temperatures at their representative location in the reactor. The range of the CET signal is 0-2300°F. Trending capability is provided with the SPDS computer system. CET signals can be trended individually or within a group.