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GDW-85-234

Director of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Edward J. Butcher, Jr.
Acting Branch Chief
Operating Reactors Branch No. 3
Division of Licensing

References: (a) License No. DPR-36 (Docket No. 50-309)
(b) NRC Letter to MY dated June 26, 1985
(c) MYAPCo. Letter to USNRC dated April 29, 1983, Inadequate Core Cooling (Generic Letter 82-28) (MN-83-83)

Subject: Answers to Questions Concerning Inadequate Core Cooling Instrumentation

Gentlemen:

Attached are Maine Yankee answers to the questions posed in Reference (b). The responses were discussed during a meeting held at Maine Yankee with a member of your staff and representatives of your consultant, Oak Ridge National Laboratories.

As discussed during that meeting, we are planning to replace instruments in the Primary Inventory Trend System (PITS) during this refueling outage to increase the accuracy of the system. Additionally, as indicated in the attached, we plan to make revisions to the power supply for the PITS during the next refueling outage (early 1987) to ensure that a portion of the system remains operable in the event of a single failure.

We believe this information is responsive to your request for additional information. Please feel free to contact me if you should have any further questions.

Very truly yours,

MAINE YANKEE ATOMIC POWER COMPANY

G D Whittier

G. D. Whittier, Manager
Nuclear Engineering & Licensing

GDW/plb

Enclosure:

cc: Dr. Thomas E. Murley
Mr. Cornelius F. Holden

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Question #1

Do the transmitters that provide functional redundancy by virtue of their overlapping ranges have independent 1E power supplies and other features qualifying them as redundant? Note: All three dp transmitters are displayed on a single three pen recorder - so that displays, as least, are not redundant. Are any modifications to be proposed to meet the single failure requirement?

Response #1

As presently installed, the three pressure transmitters received power from the same, highly reliable vital power bus. Based upon discussions with the staff at our recent meeting, Maine Yankee has agreed to provide a separate power supply from a different vital bus for one of the transmitters. Since the ranges of the instruments overlap, the new power supply configuration will assure that as a minimum, a channel which views the top of the reactor vessel to the bottom of the hot leg has power in the event of a single failure.

1. The power supply upgrade will be done during the Cycle 9/10 refueling outage (early 1987).

With regard to the chart recorder, while it is true all three displays are on one chart there is, in fact, substantial independence. Each recorder channel operates with a separate electronics package, servo motor, slide wire, etc. The only common devices are the paper transport and the power supply. The failure of the paper transport would not prevent the pens from indicating current sensed level; the power supply is from a battery backed uninterruptable vital instrument bus. The information displayed is also input to the plant process computer and can be recalled on demand in the remote chance that the recorder failed.

2. To further address your concern, we will provide PITS trend information as an input to the SPDS during the Cycle 9/10 refueling outage.

Question #2

Will the Iz transmitter (-57.7' to +57.7') show voiding with pumps on? If not, why is inventory trending with pump-on not provided?

Response #2

Inventory trending is provided under all credible circumstances. During normal plant operations and at the beginning of a large or small break LOCA the normal pressurizer level instrumentation provide the operator with reliable, redundant information.

During a prolonged small leak such as occurred at Three Mile Island Unit 2 (which the ICCI was designed to address in particular) the operators are instructed to trip the reactor coolant pumps when the indicated margin to saturation is less than 25°F, notwithstanding the indication on the inventory trending and pressurizer level instrumentation. Hence, the need for PITS to provide pumps-on level indication is not necessary, since a void in the reactor with the reactor coolant pumps still running is not a reasonable combination.

Question #3

How are level indications integrated into procedures? In particular, what interpretation guidelines are given the operators for various circumstances where indications may be misleading? (See 5th paragraph, page 5, Enclosure 1, of April 29, 1983 submittal, MN-83-83).

Response #3

We are currently in the process of revising our Emergency Operating Procedures. The Writer's Guide has been submitted to the NRC staff for review. We are proceeding with the revision based upon the assumption that the guide will be approved.

The procedural guidance to be provided will direct the operator's attention to the subcooling margin monitor until the margin decreases to 25°F or below. At this point the RCPs will be tripped. Once the coolant pumps are tripped, the level trend indicated by PITS will be one source of information designed to aid the operator. In no case will the operator be dependant upon a PITS reading alone for action.

Question #4

What is the status of the "Plant Specific Analysis" demonstrating the acceptability of the PITS during various accident scenarios as promised in response to Item 9 of Enclosure 2, MN-83-83 (scheduled for submittal in August 1985)?

Response #4

The plant specific analysis is proceeding. The improvements in the trend system developed from our observations of the equipment as presently installed and staff comments should result in a substantial improvement in accuracy and readability in this system.

The questions raised here and at our meeting have resulted in changes being planned. This will delay the final preparation of the plant-specific analysis.

3. We estimate that the analysis will be submitted by December 17, 1985.

Question #5

The DCRDR is said to be completed. What are the findings and recommendations with regard to ICC displays and interpretations? Our observations are that pump status and level indication are at opposite ends of the panel.

Response #5

The observation regarding the relative placement of the level trend instrument and the reactor coolant pump control is accurate (they are about 8' apart). However, since PITS indication is not used as a pump trip criterion, its placement was not a concern in the control room design review. Human factor modifications underway during the current refueling will place a saturation monitor display near the RCP controls.

Question #6

According to our interpretation of the error analysis, level indications can be as much as 10 ft. to 22 ft. in error during a small LOCA. Explain why this is not a problem for the operator in judging core covery/uncovery.

Response #6

The modification and reevaluation of the system errors which were discussed with the staff at our recent meeting indicates that the error suggested in the questions will be substantially decreased (See answer to Question 8). In addition, the principle function of the PITS is to present the operator with trend information, not absolute level. The improvements we have proposed (new transmitter, reassessment of certain errors associated with radiation and environmental effects, and the effects of periodic calibration) all serve to improve the accuracy. Nevertheless, no operator action is solely dependent upon PITS data.

Question #7

In a submittal MN-83-83 the range of PT-3002 was given as zero to 64.5 ft. How does the reverse indication caused by pumps-on dynamic head provide useful information with this range? It is not clear that the response to NRC concern No. 7 in the March 8, 1985 submittal MN-85-47, considers the downscale overrange of PT-3002.

Response #7

No useful information will be presented with RCPs running when the changes planned for this outage are complete.

Pressure differences beyond the nominal range of the instrument in either direction of up to 2000 psi will not damage the device, according to the manufacturer. The effect upon the output was discussed in our prior submittal. The magnitude of overrange effects are the same in both directions.

Question #8

Provide the justification for the large uncertainty of the PITS level measurement on the basis of procedure action items and plant specific operator response or propose system modifications to improve the accuracy to an uncertainty of $\pm 6\%$. Also provide the schedule for completion of the modifications.

Response #8

The alterations discussed at our recent meeting - change out of PT-3002, modified calibration and a more realistic assessment of radiation and environmental effects - will significantly improve the overall accuracy of this system.

Our latest estimate of the errors based upon the revised design is shown in the table below.

TOTAL SYSTEM UNCERTAINTY AS % OF SPAN

Transmitter	Normal/ SGTR	Steam Line Break	D-B LOCA
3001	± 1.0	- 3.0 to + 7.0	- 4.0 to + 10.
3002	± 1.0	- 3.0 to + 5.0	- 4.0 to + 7.0
3003	± 1.0	- 2.0 to + 3.0	- 3.0 to + 5.0

These estimates are based upon manufacturer's minimum specifications. Historically, similar transmitters from this manufacturer (Rosemount) have performed much better under simulated accident conditions than the published specifications. Hence, we believe that these data are conservative.

4. The necessary transmitter changes will be made during the present refueling outage.

Question #9

Clarify that there are eighteen qualified CETs, of which eight CETs are used for the backup display and provide the justification why eight qualified CETs instead of sixteen CETs are used for the backup display since there are eighteen qualified CETs available. Please provide plans and the schedule for upgrading to meet requirements of NUREG-0737, Item II.F.2.

Response #9

At the time we prepared the response to which this request for additional information refers, there were 18 fully qualified core exit thermocouples (CET). More CETs which meet the qualification guidance will be added during the upcoming refueling outage. Our use of 8 qualified CETs is twice the number demonstrated to be sufficient by Combustion Engineering as noted in Reference c. We are concerned about unnecessary duplication on the Main Control Board of information which is readily and reliably available from the computer. We will however, provide a selectable display of any of the CETs and a core map on the SPDS in addition to the core map available on demand to the printer. This will increase reliability while avoiding unnecessary duplication on the Main Control Board.

5. Implementation of CET readout and core map readout as part of the SPDS will be complete prior to startup from the 1987 refueling (Cycle 9/10).

Question #10

There is no indication in the submittal that the displays for the subcooling margin monitoring instrumentation are qualified according to the requirements of II.F.2. Please provide plans and schedule for installing qualified redundant trains of SMM.

Response #10

Some of the concern expressed in this question seems to come from confusion between our 1983 submittal which described the Subcooling Margin Monitor (SMM) as it then existed and the current improved monitors. The SMM presently provides separate qualified displays for margin to saturation for the core region and the reactor vessel head region. Each of the calculators and display units has access to all of the many inputs available though they operate independently and serve as backup for each other.

Because pressurizer pressure was considered a type A variable in the context of Reg. Guide 1.97, we have agreed to provide independent power supplies for the two channels. Each of these will be available to the SMMs.

A third SMM is provided to the operator. This senses conditions in the steam generator and calculates a margin to saturation in the U-bend region of the primary circuit based upon steam generator secondary pressure.

The SMM display units and their temperature inputs presently are powered from a common vital bus. This supply, however, is very reliable. It is battery-backed and can be cross tied to an alternate battery-backed supply which can carry all applied loads for at least two hours. In addition, these busses can be energized from the normal emergency diesel generators (DG 1 A and B) and also the new "Appendix R" diesel (DG-2).

Furthermore, as described in our 1983 submittal, the plant computer continuously calculates and can display subcooling margin utilizing temperature inputs separate from those used in the Main Control Board display.

The computer display is considered to be very reliable and much improved since our 1983 submittal. We have installed a new plant computer -- in actuality several computers -- and a battery-backed power supply. Should one computer fail, a backup unit comes on line automatically. With the exception of those brief periods when the battery or inverter are out of service for maintenance, the computer has an essentially uninterruptable power supply.

This duplication reduces the need to rely upon the backup display for the CETs as well.

Finally, there are numerous Main Control Board RCS temperature readouts (for example hot and cold leg temperature for all three loops). These data combined with RCS pressure provides the operator with all the necessary information to calculate margin to saturation using steam tables or a saturation curve. The Maine Yankee operators are trained to make such calculations and have access to appropriate tables and graphs in the control room.

Based upon the foregoing, we do not plan any further modification to the SMM.