APR 03 1978

Docket Nos. 50-438
and 50-439

Distribution
Docket File
NRC PDR
Local PDR
LWR #3 File
RSBoyd
RCDeYoung
DBVassallo
FJWilliams
ODParr
WPike
MRushbrook
RJMattson
DRoss
JKnight
RTedesco
HDenton
VAMoore
RHVollmer
MLErnst
WPGammill
ELD
IE (3)
WHaass
JRBuchanan, NSIC
TBAbernathy, TIC
ACRS (16)

Tennessee Valley Authority
ATTN: Mr. N. B. Hughes
Manager of Power
830 Power Building
Chattanooga, Tennessee 37201

Gentlemen:

SUBJECT: ENCLOSURE 2 TO THE MARCH 22, 1978 BELLEFONTE NUCLEAR PLANT ACCEPTANCE REVIEW LETTER

In a letter dated March 22, 1978, we informed you of the results of our acceptance review of the tendered Bellefonte Nuclear Plant application for operating licenses. The enclosure to that letter contained requests for additional information that we require for our detailed review of the Bellefonte facility. Request Number 031.5 of that enclosure contains a reference to an Enclosure 2 which was not included. Enclosure 2 contains specific requests for additional information regarding the Babcock and Wilcox Topical Report BAW-10085 to which B&W has responded that the information will be available either in Topical Reports BAW-10082 and BAW-10121 or in the Bellefonte FSAR. We have enclosed the referenced Enclosure 2.

We expect TVA to ensure that the required additional information is provided for our use during the Bellefonte operating licenses review.

Sincerely,
Original Signed by
Olan Parr
Olan D. Parr, Chief
Light Water Reactors
Branch No. 3
Division of Project Management

Enclosure:
BAW-10085 Requests for Additional Information
Regarding Equipment Qualification, Design
Bases and Interface Designs

ccs w/encl:
See page 2

OFFICE➤	DPM:LWR #3	DPM:LWR #3				
SURNAME➤	WPike:mt	ODParr				
DATE➤	3/ /78	3/ /78				

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Enclosure

BAW-10085 Requests for Additional Information

Regarding Equipment Qualification, Design Bases

and Interface Designs

221.10 (1.5) (5.4.2) (5.4.3) Report Section 5.4 contains a partial discussion of compliance with the RPS-II design criteria. Many of the discussions require that additional information be provided in the individual plant FSARs. Provide responses to the following:

(1) With regard to the positions of Regulatory Guide 1.22, identify and describe the plant dependent aspects of the design of RPS-II which necessitate delaying the discussion of compliance with the regulatory positions until the safety analysis report for each license application is issued.

(2) With regard to the design basis specified in IEEE Std. 279-1971, identify and describe the plant dependent aspects of the design of RPS-II which necessitate delaying presentation of the RPS-II design bases until the individual plant safety analysis report is issued.

221.13 (2.2.1) Report Section 2.2.1 is inadequate as a basis for the Offset Trip Function. Provide responses to the following:

(1) Describe how the Offset Trip setpoints are determined. This description shall include a discussion of the following:

(a) The range of power distributions used to establish the relationship between power and offset.

(b) The assumptions upon which these distributions are based (e.g., rod positions limits, core burnup history, operator action).

(c) The uncertainties and allowances that are included in the determination of the trip setpoints.

(d) The magnitudes of the assumptions, uncertainties, and allowances.

221.14
(2.2.2)
(4.1.12.5)

With regard to the DNBR trip, provide responses to the following:

(1) Describe how the DNBR trip setpoints are determined. This description shall include a discussion similar to that given in response to Request 221.13(1).

(2) Describe any uncertainties and allowances that are incorporated into the derivation of the constants used in the DNBR trip function (e.g., offset, pressure and temperature, power distribution, flux tilt, flow).

(3) List the magnitude of the assumptions, uncertainties, and allowances.

(4) Describe how the constants are determined.

(5) List the values of constants.

221.38
(None)

Provide the interface design requirements for the power supply and other connections of RPS-II to external devices.

The following, as a minimum, shall be included in the discussion of each interface:

(1) A description of the intended function of the interface (e.g., input, bypass, indicator, or output).

(2) A listing of the codes, standards, and criteria which are applicable to the interface devices (e.g., IEEE Std. 279-1971, IEEE Std. 308-1971, IEEE Std. 323-1974, General Design Criteria, Regulatory Guides).

(3) The environmental requirements for the interface.

(4) The seismic requirements for the interface.

221.38 (5) The interface signal shall be fully characterized. The following will include:

(a) Maximum, nominal, and minimum voltage, current, and frequency.

(b) Wave shape.

(c) Maximum, nominal, and minimum rate of change for items (a) and (b) above.

(d) Identification of the worst case combination of Items (a) through (c) above for each input/output and all inputs/outputs taken together.

(e) Maximum response time from sensor input to RPS-II input or RPS-II output to actuated device which will satisfy the Chapter 15 requirements for that parameter.

(f) The required accuracy of the interfacing device (e.g. input channel, output channel).

(g) The consequences of developing a voltage or current beyond the limits of Request 221.38(5)(a) above at a RPS-II terminal.

(6) A description of the provisions which are made to test the interfacing device.

(7) The interface equipment installation requirements (i.e. energy source, grounding and shielding requirements).

221.39 (2.1) (2.2) (3.1.1) (F 2-11)

In addition to the general interface information requested in Request 221.38 above, provide responses to the following:

(1) Report Section 2.0 states that one of the functions of the RPS-II is to prevent clad melting. Provide the core damage criteria.

(2) One of the differences between RPS-I and RPS-II is that the RPS-II has a low pressurizer level trip which replaces

221.39 the high reactor building pressure trip. Provide responses to the following:

(a) Demonstrate that the low pressurizer level trip is equivalent to the reactor building pressure trip in protecting the core against the effects of small breaks.

(b) Describe the effects this change has on the accuracy of reactor coolant pressure measurements.

(c) Identify the parameters which will provide diverse initiation signals to the Engineered Safety Features.

(3) Report Section 2.1.1 states, "The high RC pressure trip or high temperature trip serves as a backup to the overpower trip." Provide responses to the following:

(a) Define "backup" as used in this context.

(b) State the response times of the overpower RC pressure, and RC temperature trips, from sensor to final actuator.

(c) For each applicable core, provide curves of reactor power, reactor pressure, pressurizer level, DNBR, RC flow, temperature as functions of time for those transients for which the overpower trip is the primary trip. On each curve, indicate the appropriate trip point for the displayed parameter.

(d) Provide similar information as given in response to Requests (b) and (c) above for high pressurizer level trip and high RC pressure trip.

(e) Provide similar information as given in response to Requests (b) and (c) for low pressurizer level trip and low RC pressure trip.

(f) Provide similar information as given in response to Requests (b) and (c) for high RC temperature and low DNBR trips.

(g) Provide similar information as given in response to Requests (b) and (c) for the power/flow trip, and the low DNBR, high RC pressure, and high RC temperature trips.

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221.39 (h) State the maximum flux rate of changes for which the offset and DNBR trips are effective at a specified maximum and minimum calculating module cycle times.

(4) Report Section 2.2.2 states, "The reactor outlet pressure (P) is obtained by adding a fixed value to the measured RC pressure to account for instrument error." Provide responses to the following:

(a) Justify the addition of this constant. Demonstrate that this approach is conservative.

(b) Discuss the conservatism which could be realized by subtracting a fixed amount to compensate for measurement response.

(c) Specify the instrument error.

(d) Specify the pressure drop from the core outlet to the measurement tap.

(e) Demonstrate how the pressure drop stated in response to Request 221.39(4) is held constant for all pump status conditions and flow rates.

(5) Describe the methods and provide the results of an analysis which demonstrates that the minimum steady-state flow which is assumed for a particular combination pump status is the actual minimum steady-state flow which could exist for that combination of pumps and all possible reactor power levels. Also provide a discussion of how the smooth curve shown in Figure 2-3 was determined.

(6) Describe the conditions under which a reactor coolant pump restart is permitted during power operations and describe the effect of a pump restart on calculating DNBR and Offset Trips.

(7) Provide the results of the analysis which shows that less than 62.5% of power will be generated in either the top or bottom half of a core.

221.39 (8) Clarify the discrepancy between the discussion of digital outputs in Section 3.1.1 and Figure 2-11 which shows an output to the plant computer. Discuss the information which is transmitted to the plant process computer over this line and how the data is coded. Also discuss the electrical isolation between all digital and analog outputs.

(9) Provide the following additional information for the pump status monitors:

(a) Identify type of monitor used.

(b) Specify the transfer functions from pump mass and volume flow rates to the measured parameter. Also describe how these transfer functions were determined. Include in the discussion the range of reactor coolant temperatures and pressures used in establishing the function.

(c) Quantify the high and low measured parameter trip points. Also identify and quantify the uncertainties and allowances that are included in the determination of the trip set points.

(d) Quantify the minimum acceptable accuracy and maximum acceptable response time from sensor input to status contact output.

(e) Specify the provisions which are made to assure:

(i) on-line testability
(ii) that the whole channel (including sensors) can be periodically calibrated and response time tested.

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222.49 Report Sections 5.5. and 4.3 describe the ability to expand and/or change the CM functions and the ability to modify existing constants. With regard to these modification capabilities, provide the following:

(1) Confirm that it is your intention to make all CM program changes, including changes to program constants, at B&W's offsite facility. If this is your intention, we will pursue our review of the acceptability of the CM portion of RPS-II on the basis that all program changes, including changes to constants, will be initially, and thereafter during the life of the plant, accomplished always at B&W's offsite facility and never on-site. Within this subject of maintainability, indicate if it is B&W's intention to maintain the hardware and software of the Calculating Module during the life of the plant. If this is not your intention, describe the qualifications of the personnel and training provided by B&W that would be required to service the Calculating Module.

(2) Expand the discussion in Report Section 4.3.1 to clearly describe the procedures and controls which will be enacted (in addition to simply checking ROM part numbers) to ensure that changes in program constants and/or program changes will be documented, properly implemented and tested such that the integrity of the Calculating Module protective channel is maintained and can be verified throughout the life of the plant.

222.50 The responses to 221.33, 34, and 35 and the referenced Topical Report BAW-10082 do not provide sufficient information to ascertain the adequacy of the qualification testing program for the Calculating Module and the optical isolators used in RPS-II. In this regard, supplement the report to provide the following:

(1) A comprehensive description of the analysis and/or tests which will be performed for qualifying each component of hardware and each element of software of the Calculating Module. Include in the discussion the special hardware tests which will be performed to ensure that transient voltage surges (capacitively or magnetically coupled from high voltage electrical noise sources into the control wiring or circuits of the CM and optical isolators) can be experienced without failure or misoperation.

(2) The CM program represents an unique equipment configuration with special performance requirements. In this regard supplement your response to 221.33 (3) to clearly demonstrate that the use of equipment diagnostic programs during seismic and environmental testing will present a more severe challenge to the hardware including the timing and interaction between modules. Show that the hardware performance as required to execute the diagnostic programs adequately exceeds the performance requirements of the CM program such that the program qualification can be reasonably extrapolated by engineering analysis. Include in your response a word description and flow chart of each diagnostic program.

(3) Indicate how the results from these qualification tests will be presented in the FSAR. Also, with respect to the response to 221.34 (2) identify the "modified modules" used in RPS-II which will be qualified.

(4) A discussion of the analysis and/or tests which will be performed to demonstrate the hardware and software design reliability goals. Also discuss how you plan to substantiate the adequacy of the periodic test frequency for the CM (include sources for mean time between failure (MTBF), mean time to repair (MTTR) and other statistical data to be used).

222.52 The response to 221.33(4) is not adequate. The ATWS analysis in Topical Report BAW-10099, in part, utilizes assumption in Topical Report BAW-10019 - Systematic Failures Study of Reactor Protection Systems. BAW-10019 is based on the equipment design and protective functions of RPS-I. In this regard, amend your response to 221.33(4) to provide the information requested.

222.54 The response to 221.39 is incomplete. Amend your response to provide the information requested. The response should , in particular, address the following:

(1) The response to 221.39(2a) is incomplete and confusing. Clarify the response to clearly demonstrate the equivalence of the low pressurizer level trip and the reactor building trip; and clarify the references to Chapter 6 and 15 and Section 7.1.

(2) The response to 221.39(3b) is not adequate. Amend your response to provide a timing diagram of the protection system trip response times. Indicate on the diagram the RPS-II response times for each protective function and the additional response times for sensor inputs and output actuators which in order to determine the overall protection system response time.

References

1. For further clarification of questions and information provided by B&W in responses, refer to Appendix A, Revision 2 and Revision 3 to Topical Report BAW-10085.