

July 28, 2003

Mr. L. William Pearce
Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Post Office Box 4
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT NO. 2 (BVPS-2) - REQUEST FOR
ADDITIONAL INFORMATION (RAI) - ENGINEERED SAFETY FEATURE
ACTUATION SYSTEM (ESFAS) SLAVE RELAY SURVEILLANCE TESTING
(TAC NO. MB7589)

Dear Mr. Pearce:

By letter dated February 4, 2003, FirstEnergy Nuclear Operating Company submitted a request to extend the surveillance interval in BVPS-2 Technical Specification 3/4.3.2 for the ESFAS slave relays from 92 days to 12 months. The Nuclear Regulatory Commission staff has determined that the information contained in the enclosed RAI will be needed for the staff to complete its review. These questions were previously e-mailed to your staff on July 7, 2003, in preparation for a July 9, 2003, conference call.

As discussed with your staff, we request your response within 90 days of receipt of this letter. If you have any questions, please contact me at 301-415-1402.

Sincerely,

/RA/

Timothy G. Colburn, Senior Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosure: RAI

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION (RAI)

BEAVER VALLEY POWER STATION, UNIT NO. 2 (BVPS-2)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM (ESFAS)

SLAVE RELAY SURVEILLANCE TESTING INTERVAL

DOCKET NO. 50-412

The Nuclear Regulatory Commission (NRC) staff has determined that the information below will be needed for the staff to complete its review of the licensee's request for amendment to allow extending the ESFAS slave relay surveillance testing interval from 92 days to 12 months. The following questions relate to the licensee's application and the accompanying topical report, WCAP-15887, "Probabilistic Risk Analysis [PRA] of the Slave-Relay Surveillance Test Interval Extension for Beaver Valley Power Station, Unit [No.] 2," Revision 1:

1. On page 4 of the enclosure to licensee's amendment request it is stated, "[t]he master relays and slave relays are routinely tested to ensure operation. The test of the master relay energizes the relay, which then operates the contacts and applies a low voltage to the associated slave relays." For control circuits that include interposing relays, discuss how the test described in the submittal confirms the operability of the interposing relays.
2. Regulatory Guide(RG) 1.174, Revision 1, discusses the quality of the PRA used to support an application with respect to scope, level of detail and technical acceptability. Topical Report, WCAP-15887, states that the analysis is based on the plant-specific PRA model for BVPS-2. Provide a discussion on the applicability of RG 1.174, Section 2.2.3, "Quality of PRA Analysis" to WCAP- 15887, Section 7.1.1, "Plant Model Acceptability." If a peer review was performed, provide the results of the peer review that specify A and B observations, and discuss the applicability and impact of any findings and their resolution to the proposed slave relay surveillance interval extension.
3. Provide a description of the licensee's processes and procedures for the maintenance and update of the PRA model including PRA software and model configuration in order to demonstrate that the model reflects the as-built, as-operated condition of the plant. Provide information on the date and content of the last update of the BVPS-2 PRA.
4. Did the PRA for BVPS-2 model the slave relays or was the PRA modified to include the slave relay functions? It is not clear why the conservatism in the slave relay probabilities would be exaggerated by the quantification process. Discuss what is meant by the statement in Section 7.2.1 of WCAP-15887 that "...a [slave] relay failure probability higher than best-estimate would tend to overstate the failure probability represented by the SSPS [solid state protection system] split fraction."
- 5.a Provide a discussion on the applicability of using generic demand failure rate for the slave and interposing relays installed at BVPS-2. WCAP-13877 provides a reliability assessment for Westinghouse Type AR relays of $4.4E-08$ failures per hour. WCAP-13877 also states that although Type AR relays are industrial control relays, the

ENCLOSURE

use of an industrial control relay in SSPS applications is not typical and further states that standard references for industrial control relay reliability have little relevance to the SSPS slave relay application.

- 5.b Based on the sensitivity of slave relays to surveillance test interval extensions as noted in WCAP-10271, Supplement 2, and the reliability analyses performed in WCAP-13878 and WCAP-13877, provide a basis for the generic application of relay failure data to the interposing relays installed at BVPS-2. The NRC staff notes that Appendix E of WCAP-13877 states that since interposing relays can affect the ultimate function of the slave relay to actuate the required component, interposing relays reliability must be comparable to that of the associated slave relay. Please provide this comparison.
- 5.c Topical Report WCAP-15887 states that the approach used in WCAP-13878 and WCAP-13877 cannot be applied to other relay types or interposing relays because there is insufficient numbers of other slave relay types to develop meaningful component failure reliability values. It is noted that BVPS-2 utilizes slave relays of the type evaluated in the topical reports but does not use interposing relays covered in the topical reports. The failure rates used for the interposing relays are based on generic data not directly related to the earlier topical report evaluations. Discuss the applicability of generic data to the interposing relays installed at BVPS-2.
- 6. Provide a discussion on the applicability of WCAP-13877 and WCAP-13878 to the BVPS-2 slave relay extension request with respect to the acceptance conditions presented in the NRC staff safety evaluation report (SER) for each topical report. For example: (1) ensure that the revised surveillance interval is such that the licensee can detect an ESFAS subgroup relay failure prior to the occurrence of a second failure; (2) ensure that the procurement program for Potter and Brumfield relays is adequate to detect failures noted in the topical report; (3) ensure that all pre-1992 Potter and Brumfield MDR relays used in either normally energized, or a 20% duty cycle have been removed from ESFAS applications; (4) ensure that a contact loading analysis has been performed; (5) ensure that the qualified life for Type AR relays is based on plant-specific environmental conditions; and, (6) ensure that a program to evaluate the adequacy of the proposed test interval if two or more AR relays fail in a 12-month period is established.
- 7. With respect to external events, provide an assessment of the risk impact of seismic events, fires, floods and other external events on the proposed slave relay extended surveillance interval for both core damage frequency (CDF) and large early release frequency (LERF).
- 8. Cumulative risk - the amendment discusses current programs underway but does not provide details on previous risk informed submittals and their cumulative impact on the proposed slave relay surveillance interval extension. Discuss any previous risk informed amendment requests besides the proposed extended power uprate and containment conversion, that might impact the results for this application. Verify that the proposed extended slave relay surveillance interval and Beaver Valley PRA reflect these changes including cumulative risk.

Please provide the cumulative impacts of implementing at BVPS-2, WCAP-10271, Supplement 2, WCAP-14333, and WCAP-15376, when combined with WCAP-15887.

The amendment request states that a plant-specific analysis would show a smaller impact - but the analysis for BVPS-2 does not include relaxations for the master relays, logic cabinets, or analog channels as analyzed by WCAP-10271, Supplement 2; thus a direct comparison is not valid. Essentially, the cumulative risk has been broken up with just a plant-specific request for the slave relays (12 months). WCAP-10271, Supplement 2, was not limited to slave relay assessment. Have these relaxations accepted in WCAP-10271, Supplement 2, been implemented at BVPS-2? See page 1-1 of WCAP-15887 of the submittal.

9. Discuss the applicability of WCAP-15887 to the future acquisition of relays that may be used to replace the relays evaluated in the topical report.
10. Provide additional information about BVPS-2 risk significant configurations and the risk configuration management program (tier 2 and 3) that confirm the program's conformance to 10 CFR 50.65(a)(4) requirements regarding the proposed 12-month slave relay surveillance test interval.
11. Discuss component setpoint issues (drift, calibration, analysis assumptions, and component drift accounted for) for timing relays. These characteristics are not discussed in the topical report. Are the failure modes of these relays consistent with non-timing relays? Should these relays be grouped with the rest of the population?
12. Provide additional discussion for the statement that the SSPS split fraction values are included in the CDF sequence cutsets and include contributions from reactor trip system (RTS) component failures. See page 7-3 of topical report.
13. Was BVPS-1 relay data analysis included? The last paragraph of page 7-44 of WCAP-15877 states that operating experience for both Beaver Valley units was reviewed. But the third paragraph of page 7-44 states that test data for BVPS-1 and 2 shows that there was only one failure in 4311 quarterly demands. Discuss why the Bayesian update includes only quarterly tests and did not include monthly data for BVPS-2 (see paragraph 4 on page 7-44). What would be the effect on the results, of including BVPS-1 monthly data in the analysis?
14. Discuss why the primary contributors to SSPS split fractions discussed on page 7-41 of WCAP-15877 are single failures? WCAP-10271, Supplement 2, states that slave relay common cause is the major contributor to SSPS unavailability.

Earlier WCAPs noted that slave relay common cause failures are the major contributor to SSPS unavailability. Page 7-45 of WCAP-15877 states that the common cause probability is set to 0.1 and states that if the analysis is not sensitive to common cause then further investigation is not required. Provide a discussion on the slave and interposing relay sensitivity to common cause factors. Please also discuss the contribution of common cause relay failures.

15. In Table 7-6 on page 7-43 of WCAP-15877, total demands are listed as 4311 with 1702 demands coming from AR type relays with the only failure noted being an AR relay. There are 15 other relays listed with no failures noted. A combined demand failure rate is given. Are the uncertainties of the data accurately reflected in this result? With limited data for some of the other relays, is this an accurate demand failure rate for the relay population? The demand failure rate for AR relays would be $5.88\text{E-}4$, significantly more than the $1.4\text{E-}4$ selected as the previous demand failure rate or the $1.56\text{E-}4$ chosen as the updated demand failure rate. The plant-specific demand failure rate may be population-averaged which affects the resulting updated failure rates. Has this been accounted for (population variability curve)? In addition, the prior data, although limited to the same relay types, may be plant-averaged and may not represent the full uncertainty of the data. Please discuss these uncertainties.
16. Uncertainty is discussed in RG 1.174 and NUREG/CR-6141, "Handbook of Methods for Risk-Based Analyses of Technical Specifications," and indicates that licensees can perform sensitivity studies to demonstrate compliance with the guidelines by evaluating uncertainties related to modeling and completeness issues. RG 1.174 states that, in general, the results of the sensitivity studies should confirm that the guidelines are met even under alternative assumptions. Provide the results of this analysis.
17. As this amendment request is a surveillance interval extension, shouldn't the demand failure rate that is used be the standby stress failure rate (time-related failures). Were all failures noted for the slave relays test related, or does the data include non-test related demands as well? If all failures are used, is this conservative?
18. Include a discussion on the effects of the proposed change on dominant sequences (sequences that contribute more than 5% to risk, for example) to show that the proposed change to slave relay surveillance intervals does not create risk outliers or exacerbate existing risk outliers.

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