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Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
IPEEE Supplemental RAI Response (TAC Nos. M83588 and M83589)

Gentlemen:

By letter dated February 7, 2000 (0CNA020004), the Staff requested supplemental information concerning Entergy Operations' previous responses dated March 30, 1999 (0CAN039901), to a request for additional information (RAI) regarding the Generic Letter 88-20, "Individual Plant Examination of External Events," Supplement 4 for Arkansas Nuclear One (ANO) dated April 3, 1998 (0CNA049807). The Staff requested a response date of May 31, 2000; however, due to resource constraints, this date was extended for two weeks. This was discussed with the ANO-1 NRR Project Manager. Please find attached the supplemental responses to the previous RAIs. Should you have any further questions, please contact me.

Very truly yours,

Jimmy D Vandergrift

Jimmy D. Vandergrift
Director, Nuclear Safety Assurance

JDV/nbm
Attachment

A011

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**Supplemental RAI Responses Regarding IPEEE
Dated February 7, 2000 (0CNA020004)**

Supplemental RAI #1 (S1). A necessary step of the fire analysis addresses the vulnerability of safety-related equipment to fire and thermal damage. The response to original RAI #6 cites only the IEEE-383 cable qualification standard as a basis for the assumed thermal damage temperature of 700°F. Neither the submittal nor the RAI response states that IEEE-383 qualified cables comprise the complete set of targets of concern for ANO-1/2. The age of the plant alone makes this unlikely. Also, other safety-related equipment, for example relays and electronics, may be damaged at temperatures considerably less than 700°F. The FIVE guidance recommends a thermal damage temperature of 425°F for unqualified cables (see discussion of Box 1 in FIVE, P. 10.4-11, and Table 1E).

a) Please provide a list by fire zone of the targets (equipment and cables) assumed susceptible to thermal damage in the ANO study. Distinguish between unqualified cable and cable qualified per the IEEE-383 Standard. Include the damage temperature assumed and the basis for this assumption for each target.

b) For those scenarios with target damage occurring at temperatures less than the originally assumed 700°F, please provide a re-analysis of the core damage frequency (CDF) contribution from that zone. Include in any re-analysis the recommended adjustments in the cabinet heat release rate and heat loss factor discussed below.

Rather than compare the ANO cable jacketing material to IPEEE-383 cable jacketing material, ANO chose to use the non-qualified cable thermal damage temperature of 425° F in the fire models (for both ANO-1 and ANO-2) involving cabling fires. It should be noted that these fire model revisions also included the recommended heat loss factor (HLF) of 70% and the heat release rate (HRR) for electrical cabinets of 190 Btu/s. Per the Electric Power Research Institute (EPRI) guidance, the fire was located at the floor for electrical cabinets. The results are provided under RAI S2.

S2. The original RAIs #3 and #4 addressed assumptions made in the ANO fire study. These assumptions specifically address areas related to control cabinet heat release rates and the heat loss factor. Also, original RAI #9 was related to the assumed fire duration of 10 minutes. In combination with the assumptions of small fires (small heat release rates), high heat loss factors, and/or a limited extent of fire propagation, this assumption can lead to optimistic results. New EPRI guidance is available which may be helpful in formulating a response to this supplemental RAI.

a) Please re-evaluate those scenarios affected by new EPRI guidance regarding heat release rates for fires involving electrical cabinets. In particular, for those scenarios where the heat release rate of 65 Btu/s was assumed, provide a description of the cabinets' contents, comparing them to the EPRI guidance for this assumed value.

b) If cases are identified where the 65 Btu/s heat release rate can not be justified, please re-evaluate the CDF contributions resulting from scenarios using the higher heat release rate of 190 Btu/s. For these cases, include the effects of the hot gas layers, and plumes resulting, and use the assumed heat loss factor consistent with the new EPRI guidance.

c) Please identify those fires in which (1) the total heat release, or (2) the extent of propagation and damage, were assumed to be limited by the assumed 10 minute fire duration. For those cases, provide an estimate of the change in the fire CDF if the fire duration is extended to 30 minutes.

Fire scenarios involving electrical cabinets were re-evaluated utilizing a HRR of 190 Btu/s as recommended in the EPRI guidance document.

As a result of the revisions made to the fire models as identified in both NRC RAIs, S1 and S2, two previously screened fire zones, 2108-S, Electrical Equipment Room and 2100-Z, South Switchgear Room, did not screen out, and therefore, required further evaluation. However, the CDF for these two fire zones is 3.32E-6 and 3.59E-6, respectively, and is not considered a vulnerability under the guidance of the severe accident closure guidelines.

Utilizing the revised HRR and HLF values resulted in postulated component failures in less than 10 minutes; therefore, extending the fire duration to 30 minutes does not result in a change to the fire CDF.

S3. The response to original RAI #2 describes a plant shutdown accomplished from numerous remote locations in the plant outside the main control room. The response describes removing power from critical shutdown equipment to avoid damage and inadvertent operation from spurious signals. Also, the response notes that protection of shutdown circuits is provided by "signal conditioning circuitry," but does not describe the circuit protection. No human reliability analysis (HRA) supporting this procedure is described in either the submittal or the RAI response.

a) Please provide a description and location of the signal conditioning circuitry that would be used to isolate control room circuits in the event of a fire-induced control room abandonment.

Electrical isolation is achieved by removing control power (i.e., opening the associated breakers) to the required safe shutdown components. Required instrumentation is monitored via the safety parameters display system (SPDS). Inputs to SPDS are isolated from the control room via appropriate signal conditioning devices. A description of the SPDS and the associated isolation devices was previously submitted on July 1, 1982 (refer to Appendix A of the submittal), and subsequently approved by an SER dated May 13, 1983. A typical example of the instrumentation schematic is attached.

b) For each unit, please identify the contribution to the control room fire CDF from ex-control room shutdown scenarios.

The control room fire CDF is a product of the control room fire frequency and the probability of the failure of ex-control room shutdown scenarios. In other words, the conditional core damage probability given a fire in the control room is the same as the probability of the failure of ex-control room shutdown scenarios. The estimated value of the probability of failure of ex-control room shutdown scenarios is 0.110 and 0.056 for ANO-1 and ANO-2, respectively

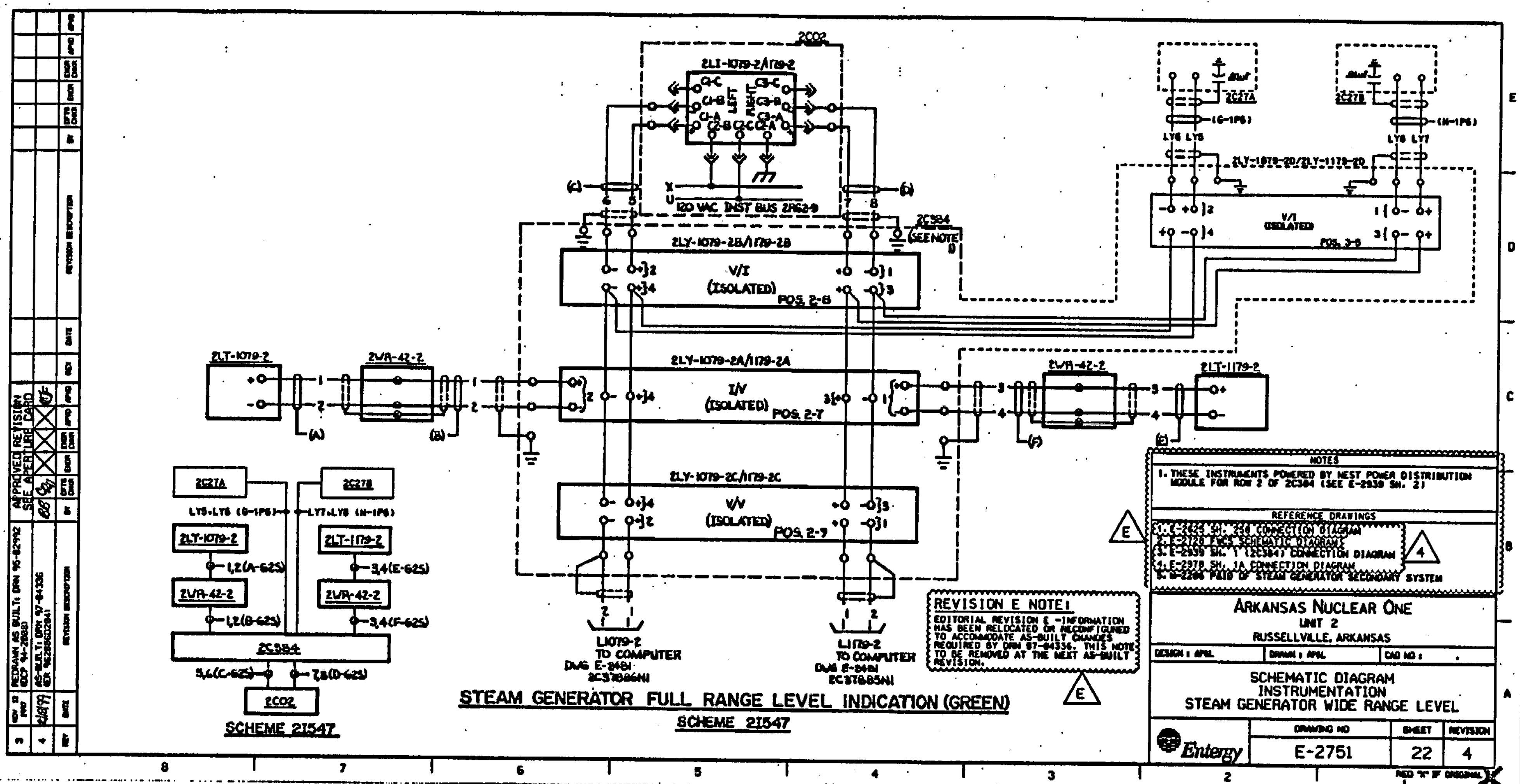
c) Please describe the HRA supporting the ex-control room shutdown CDF estimate. For each unit, provide the conditional core damage probability for the ex-control room shutdown, with and without human errors included.

The HRA methods supporting the ex-control room shutdown CDF estimate are described in the Individual Plant Examination for Severe Accident Vulnerabilities submittals, dated April 29, 1993, for ANO-1 and August 28, 1992, for ANO-2. These methods were applied to the implementation of the alternate shutdown procedure in place at each ANO unit for responding to a control room fire. The probabilities of the failure of ex-control room shutdown scenarios provided in response to item b) is all human error, i.e., without the success of the human recovery actions, the core damage frequency equals the control room fire frequency.

S4. The response to original RAI #11 states that it was assumed that manual suppression could be accomplished with the same reliability as an automatic suppression system. This is not consistent with the EPRI guidance in FIVE that suggests the use of a reliability range for manual suppression of 0.1 to 1.0.

Please either provide additional justification for the manual suppression reliabilities for which credit was taken in your analysis, or evaluate the change in CDF contribution if the reliability for manual suppression is assumed to be a value consistent with the EPRI FIVE methodology.

The ANO burning, welding, and grinding program complies with the OSHA requirements for combustibles to be removed or covered and a fire watch (trained in the use of fire extinguishers) to be present during these operations and remain at the work location for 30 minutes after the operation ceases. It is Entergy Operations' position that this level of fire protection coverage is as reliable as a preaction suppression system. Thus, the unavailability of the preaction suppression system (5.0E-2) was used with the ignition source frequency (F-1) for welding fires. The response time of the fire watch would be as quick, if not quicker, than a detection system. The only time that this quantification was used was in the ignition source frequency calculations for welding fires.


2C02
2LI-1079-2/1179-2
LEFT
RIGHT
120 VAC INST BUS 2RS2-9
2C384
(SEE NOTE 1)
2LY-1079-2B/1179-2B
V/I
(ISOLATED)
POS. 2-8
2LT-1079-2
2WA-42-2
2LY-1079-2A/1179-2A
I/V
(ISOLATED)
POS. 2-7
2WA-42-2
2LT-1179-2
2LY-1079-2C/1179-2C
V/V
(ISOLATED)
POS. 2-9
L1079-2
TO COMPUTER
DWG E-2481
L1179-2
TO COMPUTER
DWG E-2481
2C27A
2C27B
LY6 LY5
LY8 LY7
2LY-1079-2D/2LY-1179-2D
V/I
(ISOLATED)
POS. 3-9
2C27A
2C27B
2LT-1079-2
2LT-1179-2
2WA-42-2
2WA-42-2
2C384
2C02
SCHEME 21547
STEAM GENERATOR FULL RANGE LEVEL INDICATION (GREEN)
SCHEME 21547
REVISION E NOTE:
EDITORIAL REVISION E -INFORMATION HAS BEEN RELOCATED OR RECONFIGURED TO ACCOMMODATE AS-BUILT CHANGES REQUIRED BY DRN 97-04336. THIS NOTE TO BE REMOVED AT THE NEXT AS-BUILT REVISION.
NOTES
1. THESE INSTRUMENTS POWERED BY NEST POWER DISTRIBUTION MODULE FOR ROW 2 OF 2C384 (SEE E-2939 SH. 2)
REFERENCE DRAWINGS
2. E-2720 FWCS SCHEMATIC DIAGRAM
3. E-2939 SH. 1 (2C384) CONNECTION DIAGRAM
4. E-2978 SH. 1A CONNECTION DIAGRAM
ARKANSAS NUCLEAR ONE
UNIT 2
RUSSELLVILLE, ARKANSAS
SCHEMATIC DIAGRAM
INSTRUMENTATION
STEAM GENERATOR WIDE RANGE LEVEL
DRAWING NO
SHEET
REVISION
E-2751
22
4
APPROVED REVISION SEE APERTURE CARD

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