Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 501 858 5000

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U. S. Nuclear Regulatory Commission
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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
Supplemental Information Regarding ANO-2's Steam
Generator Load Handling License Amendment Request

Gentlemen:

In a letter to the Nuclear Regulatory Commission (NRC) dated September 17, 1999 (0CAN099903), Entergy Operations, Inc. submitted a license amendment request for Arkansas Nuclear One, Unit 2 (ANO-2) regarding the heavy load handling requirements and transportation provisions that would permit the movement of the original and replacement steam generators during the refueling outage planned for the fall of 2000. On June 29, 2000, Entergy submitted a follow-up letter (2CAN060010) responding to twelve questions posed by the NRC staff during their review of the license amendment request.

Based on discussions with the NRC staff during a telephone conversation on July 20, 2000, additional information is being provided in the attachment to this letter regarding questions 10 and 12 of our letter dated June 29, 2000. Question 10 concerns the contingency measures proposed in the event of a seismically induced drop of a steam generator. Question 12 clarifies the method by which Entergy concluded that the seismic loads on the runway beam support system/outside lift system (the superstructure used to lift the steam generators) were bounded by the tornado loads.

Additionally, since the proposed contingency measures related to a potential drop of a steam generator have been modified, two statements in the Determination of No Significant Hazards Consideration contained in the September 17, 1999, submittal require revision. The attachment includes the revised wording.

In support of the proposed license amendment, Entergy requests that the ANO-2 Operating License be amended to authorize the movement of the original and replacement steam

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generators through the ANO-2 containment construction opening during the replacement steam generator outage in the fall of 2000 as set forth in the license application dated September 17, 1999 (0CAN099903), as supplemented by letters dated June 29, 2000 (2CAN060010) and August 3, 2000 (0CAN080002) and evaluated in the staff's associated safety evaluation.

Entergy requests the effective date for this change to be September 25, 2000. Should you have any questions, please contact me.

Very truly yours,

Jimmy D. Vandergrift
Director, Nuclear Safety Assurance

JDV/dwb
Attachment

cc: Mr. Ellis W. Merschoff
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

Mr. Christopher Nolan
NRR Project Manager Region IV/ANO-1
U. S. Nuclear Regulatory Commission
NRR Mail Stop 04-D-03
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Mr. Thomas W. Alexion
NRR Project Manager Region IV/ANO-2
U. S. Nuclear Regulatory Commission
NRR Mail Stop 04-D-03
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

**Supplemental Information Regarding the
Steam Generator License Amendment Request**

NRC Question #10 from the June 29, 2000 Letter

Page 17 of 21 in the application states that in the event of a seismically induced drop of the steam generator and a simultaneous loss of normal offsite power, the licensee will implement contingency plans for providing (1) makeup to the ANO-2 spent fuel pool and (2) fuel oil supply to the ANO-1 EDG and transfer pump. Describe the capability to provide makeup and the source of makeup. Also describe the capability to provide electrical power.

ANO Revised Response

As noted on page 14 of 21 of the September 17, 1999, submittal, the ANO-2 licensing basis permits the use of spent fuel pool makeup from the service water system (SWS) under emergency conditions to maintain spent fuel pool level. Since makeup from the ANO-2 SWS may not be available due to the postulated loss of all AC power, provisions to permit makeup from the ANO-1 SWS will be provided. Actions to be taken in the event of degraded AC power or station blackout conditions to restore spent fuel pool cooling and maintain spent fuel pool level are detailed in the Spent Fuel Pool Emergencies procedure. The Fuel Pool Systems procedure details actions to provide emergency fuel pool makeup from service water. Use of the ANO-1 SWS to provide makeup to the ANO-2 spent fuel pool will require a change to ANO procedures to permit use of ANO-1 SWS connection SW-72 as the connection point for a hose to the ANO-2 spent fuel pool.

Upon further evaluation, the proposed compensatory measures discussed in the September 17, 1999, license amendment request regarding the fuel oil supply to the ANO-1 emergency diesel generator (EDG) and transfer pump have been re-evaluated. We believe the compensatory measures as described in this letter are less complex, faster to implement and less susceptible to human error (due to the reduced complexity) than the approach proposed in the September 17, 1999, letter.

We propose to credit the alternate AC diesel generator (AAC generator) as described in our letter dated June 29, 2000 (2CAN060010), but only for non seismic-induced failures. As discussed in the September 17, 1999, and June 29, 2000, letters, administrative controls will be utilized to confirm the availability of the AAC generator prior to movement of the steam generators in the vicinity of the outside lift system.

For seismic events, we propose to return to the original concept of restoring fuel oil to the emergency diesel generators, but in a different manner than described in the proposed compensatory measures discussed in the September 17, 1999, letter. Rather than supplying temporary fuel oil connections from the fuel oil storage facility to the ANO-1 emergency diesel generator day tanks and temporary power to the fuel oil transfer pumps,

we propose to pre-stage at least two mobile fuel oil transport tankers in an appropriate location to serve as an alternate fuel oil supply source for the emergency diesel generators. Each tanker truck will have the capability to pump the required fuel oil directly from the tanker to the ANO-1 emergency diesel generator day tanks via a temporary hose that can be quickly connected following a postulated seismic event. The tankers will provide sufficient fuel oil to operate the emergency diesel generators for approximately 76 hours (approximately 38 hours per diesel) assuming two, 7000 gallon tankers at a loading consumption rate of 3 gpm (see assumptions below). Temporary fittings will be attached to the day tanks in advance which will minimize the time required to make the connection. The inherent design of transport tankers (rigorous suspension systems and pneumatic tires) is such that they have a high confidence of surviving an earthquake.

A one-hour time restraint to implement the contingency measures is based on the following assumptions:

- No other accidents are assumed other than a loss of offsite power (and the fuel oil damage due to the steam generator drop)
- The emergency diesel generators would be loaded for a "typical" degraded power condition (i.e., loads expected following a loss of offsite power and reactor trip with no other accident loads) in accordance with ANO-1's emergency operating procedures which results in a 3 gpm fuel consumption rate
- Conservative assumption of day tank initial volume of 250 gallons (originally assumed 275 gallons)

Consistent with our September 17, 1999 submittal, equipment used to implement the compensatory measures will be staged in an appropriate location where it is protected from damage should a seismic event occur; however, personnel will not need to be prestaged because the revised compensatory measures are simpler and less time will be required to implement them. To further reduce the time required to implement the compensatory measures, temporary installations will be installed in advance wherever possible, i.e., where it can be assumed the temporary installations will survive a seismic event. As originally committed, personnel will be trained to implement the compensatory measures and designated as responders in the event of a steam generator drop event.

As an added measure of assurance, the steam driven emergency feedwater pump, P7A, provides defense-in-depth should the emergency diesel generator cease functioning due to a loss of fuel oil. P7A can be utilized to maintain the unit in a steady-state condition (i.e., no reactor coolant system cooldown) by relying on battery power for instrumentation for a period of at least five (5) hours after the emergency diesel generator ceases operation. Therefore, although our work plan will be written to implement the contingency measures within the expected emergency diesel generator run time of one hour, a minimum of six (6) hours will actually be available to implement the contingency measures if the use of P7A is credited. Procedures currently exist and operators are already trained to use P7A for this purpose.

Except where modified by this submittal, the remaining commitments contained in our letters dated September 17, 1999, and June 29, 2000, are unaltered. The determination of no significant hazards considerations contained in the September 17, 1999, letter are modifed in the following section.

Revised Determination of No Significant Hazards Consideration

Based on the information in this letter, the no significant hazards conclusions from the September 17, 1999, letter should be revised. The last sentence in the first paragraph on page 17 of 21 should be replaced with the following sentence:

> "In conjunction with the unit shutdown, contingency measures will be taken to compensate for the loss of the normal fuel oil supply to the emergency diesel generators."

The last sentence on page 17 of 21 should be replaced with the following two sentences:

> "While this event is very unlikely due to the low frequency of earthquakes and the small amount of time that a steam generator will be in a position to cause damage, Entergy will provide contingency plans and compensatory measures to compensate for the loss of the normal fuel oil supply to the emergency diesel generators. Long term actions to provide makeup water to the spent fuel pool may be necessary, but no immediate actions are required."

NRC Question #12 from the June 29, 2000 Letter

Provide a summary of the results of the structural analyses performed to substantiate the statement (on page 5 of 21 in the application) that the seismic loads determined in the evaluations of runway beam support system/outside lift system are bounded by the tornado loads. Describe briefly how you obtained the design basis response spectra used in your seismic evaluations of the affected structures, systems or components and the runway beam support system/ outside lift system or steam generator transporter.

ANO Revised Response

The fundamental frequency of the outside lift system towers was calculated using a simplified model and Rayleigh's Equation. This approximate approach was benchmarked by testing it on a previous outside lift system installation for which the frequency had been determined using a finite element model. This analysis determined that the outside lift system tower fundamental frequency was 0.77 Hz.

Tornado wind forces on the tower were calculated for E-W and N-S wind directions, with and without the header beams installed, using ASCE 7-95. These were used to calculate the applied forces and base reactions of the tower. The seismic acceleration required to generate an equivalent tornado wind force and base moment was calculated to be 0.4g.

The calculated seismic acceleration of 0.4g was compared to the response spectrum as follows. ANO-2 Safety Analysis Report (SAR) Table 3.7-2 would allow the use of 5% damping for a steel structure under DBE; however, this evaluation conservatively used 0.5% damping at the corresponding system frequency of 0.77 Hz. Using Figure 3.7-1 from the SAR, the design basis earthquake acceleration for 0.5% damping at a frequency of 0.77 Hz was estimated as 0.3g. The corresponding value using 5% damping would be approximately 0.15g (SAR Figure 3.7-1). Since the seismic accelerations required to create loads greater than those from a tornado exceed the seismic accelerations from the SAR response spectrum (at 0.77 Hz), the tornado loads were determined to be limiting.