



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO MANUAL PRE-TRIP ELECTROMATIC RELIEF VALVE USE

FACILITY OPERATING LICENSE NO. DPR-51

ENERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1

DOCKET NO. 50-313

1.0 INTRODUCTION

This is in response to Entergy's presentation to the staff on February 8, 1994, regarding manual actuation of the electromatic relief valve (ERV) to avoid reactor trip. This meeting was prompted by the June 13, 1993, event during which one of the two operating main feedwater pumps tripped at 100-percent power. The reactor operator, following plant abnormal operating procedures, manually opened the pressurizer ERV to reduce pressure and avoid a reactor trip on high primary pressure. The present Arkansas Nuclear One, Unit No. 1 (ANO-1) ERV automatic lift setpoint (which was established in 1980 as one of the post-TMI requirements) is above the high-pressure trip setpoint, which eliminates automatic ERV actuation as a means of pre-trip pressure control during power operation. The ANO-1 plant procedures were modified in 1983 to allow manual pre-trip ERV operation. Cycling the ERV to prevent a high-pressure trip concerns the technical staff because it could potentially increase the likelihood of a small-break loss-of-coolant accident (LOCA).

2.0 BACKGROUND

The Entergy presentation included a probabilistic evaluation showing that the core damage frequency (CDF) associated with pre-trip manual use of the ERV is low. In their evaluation, the CDF associated with a reactor trip induced by a feedwater pump trip was calculated to be $9.3E-07$ per reactor-year, and the CDF associated with a feedwater pump trip with manual use of the ERV was calculated to be $6.5E-07$ per reactor-year. On the basis of these results the licensee stated that "...there is no difference in the risk associated with the high pressure trip and manual ERV use. From a numerical standpoint, however, an argument potentially could be made that manual ERV use is safer." One of the assumptions that the licensee made in its analysis was that the manual use of the ERV will always avert a reactor trip. In fact, the ANO-1 ERV cycling history that was provided by the licensee shows that, since 1980, operations personnel have attempted to avert reactor trips by manually opening the ERV on 14 separate occasions. Of the 14 attempts, 8 successfully averted reactor trips and 6 attempts resulted in reactor trips. Furthermore, supplemental calculations provided by the licensee contain an estimate of the fraction of high-pressure trips that must be avoided in order to balance the increase in risk associated with the manual use of the ERV. The conclusions

in Attachment A state that "...the overall CDF increases if a reactor trip occurs \geq 30% of the time the ERV is used in an attempt to avert a reactor trip on high RCS [reactor coolant system] pressure. Thus, conversely, a trip aversion success rate higher than 7 in 10 is estimated to increase the overall plant safety." Recall that the licensee's CDF analysis assumes a trip avoidance success rate of 10 in 10 or 100%, whereas its supporting data shows 8 in 14 or a 57% trip avoidance success rate. Therefore, since a reactor trip has occurred more than 30% of the time the ERV has been used in an attempt to avert a reactor trip on high pressure at ANO-1 (actually 43% of the time), it could be concluded by the licensee's own analysis that the overall CDF increases.

During a high-pressure transient, the ERV may be manually cycled more than once to try to control pressure and avert a reactor trip. For example, the last time the ERV was used in this manner at ANO-1, it was cycled three times. The added risk of each successive manual ERV challenge during a high-pressure event does not appear to be accounted for in the licensee's calculation.

Although the above concerns allude to a potential increase in risk for manual use of the ERV, the small magnitude of the potential increase and the uncertainties inherent in the data and calculations are such that it cannot be concluded without a more detailed evaluation that the risk associated with manual ERV use is higher than the risk associated with a reactor trip.

3.0 CONCLUSION

Based on the information presented by the licensee, the staff concludes that ERV manual actuation at ANO-1 as described by the licensee does not constitute a significant risk to the public and does not negate the bases for the staff evaluation of September 26, 1983, on the resolution of NUREG-0737 Items II.K.3.1 and II.K.3.2. However, the licensee's evaluation cannot be considered precise enough to support their argument that there is no difference in the risk associated with the high-pressure trip and manual ERV use. The staff believes that, while pre-trip manual ERV actuation of itself does not pose a significant risk at ANO-1, routine use creates a concern because it indicates that a condition in the plant that is causing safety systems to be challenged routinely is not being resolved. The staff holds this same view with respect to frequent reactor trips. The staff believes that the way to minimize ERV usage is to eliminate the causes of transients requiring ERV usage. The staff recognizes Entergy's efforts to improve main feedwater performance which was the major transient contributor to ERV usage.

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