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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Human Engineering Discrepancy (HED) 040

Gentlemen:

By letter dated March 28, 1994 (2CNA039403), the Staff requested additional information regarding HED 040 for Arkansas Nuclear One (ANO), Unit 2. HED 040 addressed the fact that the control room air intake is located in close proximity to the emergency diesel generator exhaust. Under certain scenarios, when operating a diesel generator, exhaust fumes are drawn into the control room. The Staff requested additional information concerning 1) our basis for reclassifying HED 040 from a Category 1 to a Category 2 HED and 2) licensee event report (LER) 91-008, "Control Room Ventilation Isolation Caused by Emergency Diesel Generator Exhaust Fumes in the Intake Air Duct." Our responses to the Staff's questions are attached. Should you have any further questions, please contact me.

Very truly yours,

Dwight C. Mims

Dwight C. Mims
Director, Licensing

DCM/nbm
Attachment

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ANO-2 HED 040

Design details pertinent to the LER event are further described in section B of LER 91-008; however, to aid understanding of this issue, a brief summary describing the three primary modes of operation of the control room ventilation system is provided here. The normal control room ventilation system has two modes of operation, 1) recirculation and 2) outside air. The normal control room ventilation system can be placed on recirculation or outside air depending on the positioning of the dampers in the ventilation ductwork. In the normal recirculation mode, the supply air suction is taken from the exhaust fans with a small amount of make-up from outside air. In the outside air mode suction is taken directly from outside air and exhausted to the outside. The emergency air conditioning and filtration system is a totally separate system used for cooling the control room under isolation conditions.

1. Would the licensee's original proposed correction of the HED have prevented the LER-related event (LER 91-008)? The answer to this question would be purely conjecture. A project scoping report (PSR) was generated to evaluate the installation of an interlock scheme to automatically transfer the control room ventilation system to normal recirculation upon receipt of a diesel generator start signal. This would reduce, but not totally eliminate (since the design of the normal recirculation mode is not intended to totally isolate the control room from outside air) the introduction of diesel exhaust fumes into the control room. During the PSR review stage, it was concluded that adding circuits to an already complex scheme was undesirable considering the minor benefit obtained.

Would automatic ventilation isolation have been defeated? Again, it is difficult for us to speculate regarding actions the operators would have taken had automatic ventilation isolation been installed. According to the current design practice of placing manual overrides in systems, it could have been defeated had such a system been installed although it is not considered prudent practice to use such features except for extenuating circumstances.

2. What has the licensee done to prevent this event from reoccurring again, beyond what is described in the LER? As stated in section E of the LER, the equipment functioned as designed and there was no adverse interference with personnel in the performance of safety-related duties; therefore, no other actions have been taken.

3. Describe the operating procedure changes that were implemented to correct the HED. The diesel generator operating procedure was modified to require the control room ventilation system to be placed in normal recirculation whenever the diesel was manually started. This is the only procedure change that was implemented and was in effect in October 1989.

Under what conditions are these procedures applicable? During surveillance testing.

4. What informal operational discretions for realigning the control room ventilation system, if any, are there? The operators may place the control room on normal or emergency recirculation at any time they deem necessary.

5. Are operators trained on this event? If so, describe the training. Operators are generally trained on LER related events during their normal requalification cycle training. Based on the significance of the event, it is addressed either as a separate topic or as a part of the operations manager's overview.

6. Has the licensee investigated how other utilities have addressed similar HEDs? Yes, ANO sent out a question on the INPO Nuclear Network. Only one utility reported having a similar problem. The problem was corrected by placing the control room ventilation on recirculation.

7. **What is the composition and release rate of the diesel generator exhaust fumes? Specifically, what is the percentages of carbon monoxide and carbon dioxide?** According to the Unit 2 diesel generator vendor, the composition of the diesel exhaust fumes from an opposed piston engine operating at 2850 kW (3963 brake-HP) in the units of grams/(brake-hp-hour) is as follows: NOX = 8.8, SOX = 1.02 using 0.3% sulfur fuel, CO = 0.8, hydrocarbons = 0.3, and particulates = 0.2. The exhaust flow from a typical engine is 57,400 lb/hr at 3960 brake-horsepower. In this exhaust, carbon monoxide makes up 0.015% of the volume and carbon dioxide makes up 5.5% of the volume.

8. What is the location (distance and elevation) of the diesel generator exhaust pipe relative to the control room air intake? The diesel exhausts are located on Elevation 424. The control room air intake is located on Elevation 446 approximately 55 feet north and 105 feet east of the nearest diesel exhaust. The remaining exhaust is located approximately 50 feet south of the other exhaust.

9. Has the licensee evaluated the quantity of carbon monoxide, carbon dioxide, and other combustion products which could collect in the control room during diesel generator operation to verify that the diesel generator fumes are merely an annoyance (assuming outside air is being supplied to the control room)? Air samples of the control room were made on three separate occasions during the summer of 1988 when the diesel was operating. The tests found no detectable level of combustion gases for the atmospheric conditions on that day. The configuration of the control room ventilation system during the test was not documented; however, it was likely on normal recirculation or outside air. These are the two most frequently used configurations because when the control room emergency air conditioning system is in service, it isolates the computer room which is located above the control room. It is undesirable to have no cooling in the computer room.

Conclusion

As discussed in the LER, the circumstances (i.e., control room ventilation line-up and specific meteorological conditions) contributing to this and similar events were unique and not likely to occur in the future. The nature of diesel exhaust fumes (i.e., smell) provides a quick ability for detection such that actions to prevent effects on human performance can be taken. Also, section 2.3.2.2.1 of the ANO-2 Safety Analysis Report shows the prevailing wind direction to be from the east and east-northeast which would tend to blow the diesel generator exhaust fumes away from the control room air intake. As stated in our November 29, 1989 (0CAN118914) correspondence, if diesel generator exhaust fumes were to become a problem, self-contained breathing apparatus (SCBAs) are available. SCBAs continue to be available in the control room; however their use is not proceduralized. After several years of operation which have demonstrated the low frequency and minor consequences of this issue, it was concluded that the diesel generator exhaust fumes are a nuisance only, not a safety concern. In consideration of the above, in conjunction with input from the operations staff, HED 040 was no longer considered to be a category 1 HED and was reclassified as a category 2 HED.