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July 3, 2003

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
NRC Triennial Fire Protection Inspection Report 01-06; EA-03-016
Significance Determination Process Report

Dear Sir or Madam:

Attached is the subject Significance Determination Process Report that was performed for the apparent violation described in a March 25, 2003, letter from Mr. Dwight D. Chamberlain to Mr. Craig Anderson at Arkansas Nuclear One. The attached information will be discussed at the July 10, 2003, Regulatory Conference at Arlington, Texas. Should you have questions or comments, please call Mr. Glenn Ashley at 479-858-4617.

There are no new commitments contained in this submittal.

Sincerely,

Sherrie R. Cotton

Sherrie R. Cotton
Director, Nuclear Safety Assurance

SRC/RMC
Attachment

E/17

cc: Mr. Thomas P. Gwynn
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U. S. Nuclear Regulatory Commission
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Summary

Several parameters contribute to the extent and timing of fire damage in fire zone 99-M. These include:

- Size and profile of the initial fire, i.e., how fast the fire grows to its peak and how long it takes before it begins to decay
- The cable damage temperature. ANO verified through review of the original and current plant design and installation documents that the cables installed throughout the plant are predominantly thermoset. Thermoplastic cables are, however, used on a very limited basis. A review by the ANO staff identified no thermoplastic cables in the 3 fire zones in unit 1 where this issues was examined for risk, namely, 99-M, 100N and 104S. ~~Therefore our assessment assumed damage and ignition temperature of 700°F for cables~~ in these fire zones. [redacted]
- Size and location of any cable fire that may be initiated by the initial fire.

Ex5

The following is a summary of the insights from the fire modeling:

- The maximum expected fire scenario in the room is an energetic arcing fire in the 4KV switchgear. This is for two reasons. First, this event is capable of the largest set of immediate circuit/equipment damage and, second, the event is capable of initiating secondary cable fires that can cause additional time-phased circuit/equipment failures.
- A credible fire scenario cannot be postulated in this zone which would result in an immediate damaging 700°F hot gas layer. A large ~2MW fire is needed to produce a damaging 700°F HGL in this fire zone. Only cable fires in the room are capable of generating such intensity if enough cables are burning. Even if such a large cable fire can be sustained (unlimited oxygen) it will take about 2 hours for the cable fire to propagate to this size.
- ~~Large elevated cable fires that continue to grow~~ unabated can not be sustained due to oxygen limitation:

  1) Cable fires can only burn inside the hot gas layer. Assuming no manual intervention, with either closed or open doors, the cable trays will be immersed in smoke because the height of the door is not high enough to allow for smoke movement from the top section of the room, and no automatic extraction system is in place. The fire eventually would be oxygen controlled if it keeps growing in such an environment.. CFAST results are consistent with this argument.

  2) If the simulation is run with open doors, AND the fire is assumed at the elevation lower than the steady state position of the hot gas layer, the fire will have enough oxygen to burn at the stipulated intensity. Therefore, assuming open doors, and a cable fire located about 1 m high growing up to 2 MW in 1.5 hours can generate a hot gas layer of 700 °F. All cable trays in fire zone 99-M are located above the steady state position of the hot gas layer, i.e., 6 ft. With closed doors, the smoke layer would reach the floor, and eventually the fire will be oxygen controlled.

II.2 Analysis of Operator Response and Reliability

II.2.1 Information Collection and Simulation of Fire Scenarios

II.2.1.1 Purpose

The Human Reliability Analysis (HRA) team of Bill Hannaman and Alan Kolaczkowski lead by Bijan Najafi visited the ANO-1 site on April 14 through 18th to obtain input for the HRA task, and support other parts of the evaluation of a hypothetical fire in location 99-M. Parallel work on fire modeling was performed by, Francisco Joglar. The aim is to support a reevaluation of the CCDP for 99-M that includes the impact of realistic fire growth timing and fire damage on human actions. This work follows a significance determination evaluation by the NRC. The significance determination process reached a conclusion that there was a lack of adequate procedures and the strategy for implementing the manual actions was inadequate, which may result in a potential for a greater than green condition for ANO-1.

Additional information has been obtained to evaluate the potential for more clearly addressing the analysis assumptions used in modeling both the fire scenario (growth and damage of the fire), and a crew's ability to manage the plant cooling from the control room and locally. To evaluate the feasibility of control room and manual actions the ANO-1 plant simulator and local task walkdowns were used to evaluate the feasibility of performing local control actions.

II.2.1.2 Key activities

The key activities accomplished for the HRA evaluation with ANO-1 were to (1) Identify a set of realistic fire scenarios for zone 99-M, (2) Identify and visit locations in the plant where local manual actions could be performed to maintain cooling and avoid core damage given a fire in 99-M, (3) Observe two simulations of a fire in 99-M originating in the A4 switchgear (one with the original procedures and one with new procedures that include pre-emptive actions, (4) Review the ANO-1 PRA model for addressing the fire issues in 99-M, (5) Adjust the HRA values (based on walkdowns and simulation observations) in the existing model to account for fire dependencies, (6) Identify actions that are fire unique that should be added to the model. Then develop findings for the HRA.

II.2.1.3 Plant Support

The HRA team was well supported by the plant operational personnel in this effort. Dale James, Engineering manager made arrangements and provided information as needed. Ron Rispoli, and Tom Robinson, fire protection, provided information and escort during the walkdowns, Mike Cooper, licensing, discussed elements of the work, Ron Hendrix, Dale Smith and Randy Kulbuth, electrical engineering, provided evaluations of circuits in the cable trays to support development of the component damage as a function of cable locations. Ken Canitz, provided integration of the fire growth damage model into the inputs of the simulator and testing of the