



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 15, 2015

MEMORADUM TO: Anne T. Boland, Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Richard P. Correia, Director */RA/*
Division of Risk Analysis
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF FINAL ARKANSAS NUCLEAR ONE UNIT 2
ACCIDENT SEQUENCE PRECURSOR ANALYSIS

This memorandum transmits the final results of an accident sequence precursor (ASP) analysis of an operational event that occurred at Arkansas Nuclear One Unit 2 on December 9, 2013. The Office of Nuclear Regulatory Research (RES) did not request a formal analysis review from the licensee in accordance with U.S. Nuclear Regulatory Commission Regulatory Issue Summary 2006-24, "Revised Review and Transmittal Process for Accident Sequence Precursor Analyses," because the analysis had a preliminary conditional core damage probability (CCDP) of less than 1×10^{-4} . The final results determined that the operational event had a best estimate CCDP of 2×10^{-6} , and therefore, is not considered a *significant* precursor. A copy of the preliminary analysis was provided to the Office of Nuclear Reactor Regulation (NRR) and Region IV staff as a courtesy.

The ASP Program continues to systematically review licensee event reports (LERs) and all other event reporting information [e.g., inspection reports (IRs)] for potential precursors, and to analyze those events which have the potential to be precursors. The complete summary of all Fiscal Year 2014 precursors will be provided in the annual Commission paper on the status of the ASP Program and Standardized Plant Analysis Risk (SPAR) Models due to be issued in October 2015.

Transmittal to Licensee Requested. We are requesting NRR to send the enclosed final ASP analysis to the licensee for their information. The ASP analysis will be made publicly available in 90 days from the date of the memorandum. Please inform us if additional time is needed to send the ASP analysis to the licensee.

CONTACT: Keith Tetter, RES/DRA/PRB
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Final ASP Analysis Summary. A brief summary of the final ASP analysis, including the results, is provided below.

Fault in Unit Auxiliary Transformer Leads to Reactor Trip and Partial Loss of Offsite Power (December 2013) at Arkansas Nuclear One Unit 2. This event is documented in LER 368/13-004 and in IRs 05000368/2014002.

Executive Summary. On December 9, 2013, at approximately 7:47 am, an electrical fault on the Unit Auxiliary Transformer (UAT) resulted in a fire and catastrophic failure of the transformer. This caused an automatic reactor and main turbine trip, lockout of the Switchyard Auto Transformer (SAT), loss of power to Startup Transformer (SUT) 1, and a lockout of SUT 3 when voltage degraded on the non-vital 6900V buses supplied by the UAT. These conditions caused a loss of one of the two available offsite power sources for Unit 2 that resulted in an auto-start of the Unit 2 Emergency Diesel Generator B to supply Safety Bus 2A4. When the 6900V buses supplied by the UAT de-energized, loss of the main feedwater system occurred and the emergency feedwater (EFW) system automatically actuated.

The root cause of the UAT catastrophic failure was failure of its protective relays to isolate a bus fault due to improper installation of a differential current relay output wire. The root cause of the bus fault was improper installation of the 6900V Phase C flexible link bolted connection that led to insulation breakdown. The lockout of the SAT occurred due to an overcurrent protective relay initiated trip that is suspected to have been caused by a fault at the 22kV structure that supplies SUT 3. Lockout of the SAT, which supplies one source of offsite power to SUTs 1 and 3, is designed to initiate a lockout of both transformers, however only a SUT 3 lockout occurred.

According to the risk analysis modeling assumptions used in this ASP analysis, the most likely core damage sequence is a loss of main feedwater (LOMFV) followed by failures of the EFW system and once-through cooling. This accident sequence accounts for approximately 79 percent of the CCDP for the event. In general, these results are consistent with at-power LOMFV events previously analyzed by the ASP Program at other PWRs.

Summary of Analysis Results. This operational event resulted in a best estimate CCDP of 2×10^{-6} . The detailed ASP analysis can be found in the enclosure.

Sensitive Information. The detailed ASP analysis has been reviewed in accordance with current guidance for sensitive unclassified non-safeguards information, and it has been determined that it may be released to the public.

Enclosure:
As stated

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DISTRIBUTION:

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ADAMS Accession No.: ML15238B485

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