May 16, 2013

MEMORADUM TO: Michele G. Evans, Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

SUBJECT: TRANSMITTAL OF FINAL WOLF CREEK GENERATING STATION ACCIDENT SEQUENCE PRECURSOR ANALYSIS

This memorandum transmits the final results of an accident sequence precursor (ASP) analysis of an operational event that occurred at Wolf Creek Generating Station on January 13, 2012. This analysis has a final conditional core damage probability (CCDP) of 5×10^{-4} which is less than threshold for a *significant* precursor (i.e., CCDP greater than or equal to 1×10^{-3}).

The Office of Nuclear Regulatory Research (RES) requested 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 CCDP greater than 1×10^{-4}. No comments were received from the licensee, and no additional comments from the Office of Nuclear Reactor Regulation (NRR) and Region IV staff were provided.

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 FY 2012 ASP events will be provided in the upcoming Commission paper on the status of the ASP Program and Standardized Plant Analysis Risk (SPAR) Models due to be issued in October 2013.

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 publically available after the analysis has been transmitted to the licensee. Please inform us when the ASP analysis has been sent to the licensee.

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Final ASP Analysis Summary. A brief summary of the final ASP analysis, including the results, is provided below.

Multiple Switchyard Faults Cause Reactor Trip and Subsequent Loss of Offsite Power (January 2012) at Wolf Creek Generating Station. This event is documented in LER 482/12-001 and IRs 05000482/2012008, 05000482/2012009, and 05000482/2012010.

Event Summary. On January 13, 2012, at 2:02 p.m. CST, the site experienced a loss of offsite power (LOOP). The event resulted from two distinct faults. The first fault was on Phase "C" of the Main Generator Output Breaker 345-60. This fault resulted in the 345 kV East Bus differential relay protective logic to open Breakers 345-120, 345-90, 345-60, 13-48, and 69-16, which together de-energized the East Bus. This fault resulted in a main generator trip signal, and started the sequence of events to shift the source of power to most station loads from the Unit Auxiliary Transformer (UAT) to the Startup Transformer (SUT) in a sequence called a fast bus transfer. The second fault, a phase differential, occurred on Phase "B" of the SUT and resulted in the 345 kV West Bus differential relay protective logic opening Breakers 345-40, 345-70, and 345-110, de-energizing the remaining portions of the switchyard. The second fault also resulted in the SUT phase differential relay protective logic opening Breakers PA0110, PA0201, and PA0202.

Emergency Diesel Generators A and B automatically started and powered their respective safety buses approximately eight seconds after the start of the event. At 4:45 p.m., the 345kV East Bus was reenergized from the La Cygne line by closing Breaker 345-120, restoring offsite power to the Train A safety-related components (Bus NB01). On January 15th, operators restored offsite power to Bus NB02 by closing the Alternate Feeder Breaker NB0212 to power Train B from Train A once in Mode 5 and EDG B was secured. Electrical repairs were not completed until February 4th, when the SUT was returned to service and damaged wires and a bus potential transformer for Breakers PA0201 and PA0110 were replaced and the breakers were returned to service.

Summary of Analysis Results. This operational event resulted in a CCDP of 5×10^{-4}. The detailed ASP analysis can be found in the Enclosure.

Risk Insights. According to the model assumptions used in the ASP analysis, the most likely core damage sequence is the mechanical failure of the reactor coolant pump seals (due loss of seal injection and cooling) which creates a small loss-of-coolant accident and the subsequent failure of low-pressure recirculation (from the combined likelihood of either equipment or operator failures) leading to the failure of heat removal after reasonably quick recovery of offsite power.

The second and third most likely core damage sequences involve a postulated station blackout condition (due to various emergency diesel generator and service water failures) that combined with the failure of either the turbine-driven auxiliary feedwater pump or failure of a power-operated relief valve to close (after it had opened) with failure of operators to restore offsite power within one hour.

In general, these results are consistent with LOOP events analyzed by ASP at pressurized-water reactors.

Sensitive Information. The detailed ASP analysis has been reviewed by my staff in accordance with SECY-04-0191, "Withholding Sensitive Unclassified Information Concerning Nuclear Power Reactors from Public Disclosure," and it has been determined that it may be released to the public.

Enclosure:
1. Final ASP Analysis

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Enclosure:
1. Final ASP Analysis

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