November 25, 2013

MEMORADUM TO: Michele G. Evans, 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 RIVER BEND 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 River Bend Station on May 24, 2012. 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 conditional core damage probability (CCDP) greater than 1×10^{-4}. Comments from the Office of Nuclear Reactor Regulation (NRR) and Region IV staff were discussed between our staffs and changes were made to the analysis. Comments from the licensee were reviewed by RES and incorporated into the analysis, where appropriate.

The ASP Program continues to systematically review licensee event reports (LERs) and all other event reporting information [e.g., inspection reports (IRs)] for potential accident precursors, and to analyze those events which have the potential to be accident precursors. The complete summary of FY 2012 ASP events is provided in SECY-13-0107, "Status of the ASP Program and Standardized Plant Analysis Risk Models," dated October 4, 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.

CONTACT: Christopher Hunter, RES/DRA
301-251-7575

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

Loss of Normal Service Water, Circulating Water, and Feedwater Due to Electrical Fault (May 2012) at River Bend Station 2. This event is documented in LER 458/12-002 and in IRs 05000458/2012009 and 05000458/2012010.

Executive Summary. Due to an electrical feeder cable fault to nonsafety-related 4.16 kV Bus NNS-SWG2A that occurred on May 21, 2012, the licensee was powering all circulating water (CW) pumps, feedwater (FW) pumps, and normal service water (NSW) pumps from a single source (Bus NNS-SWG2B) while repairs were being performed. This electrical alignment left the plant susceptible to a loss of all three systems (CW, FW, and NSW) given a single failure causing the unavailability of nonsafety-related 4.16 kV Bus NNS-SWG2B. On May 24th, a fault on FW Pump B motor termination box was not isolated by the associated motor feeder breaker (due to failed lockout relay) causing the loss of Bus NNS-SWG2B leading to loss of CW, FW, and NSW, and a subsequent reactor trip. The loss of feedwater and circulating water pumps caused the unavailability of the normal source of reactor inventory control and decay heat removal via the main condenser, respectively.

Given the loss of FW, reactor core isolation cooling (RCIC) or high-pressure core spray (HPCS) must supply makeup to the reactor or operators must depressurize the reactor coolant system (RCS) to allow low-pressure injection systems to provide inventory control. The safety relief valves (SRVs) provide RCS pressure control if the main condenser is unavailable. However, given the loss of NSW, at least 2 of the 4 standby service water pumps must successfully start and run to provide the capability to transfer heat to the ultimate heat sink. With no standby service water to transfer heat to the ultimate heat sink, suppression pool cooling (required for RCIC, HPCS, and successful pressure control via the SRVs), shutdown cooling (via the residual heat removal system), and containment heat removal are rendered unavailable.

According to the risk modeling assumptions used in this ASP analysis, the most likely core damage sequences (accounting for approximately 96% of the CCDP) are the loss of power to all NSW, FW, and CW pumps and subsequent reactor trip (which occurred during the event) combined with postulated failures/unavailabilities of standby service water components causing system failure. If the standby service water system had failed (leading to the loss of the ultimate heat sink) without recovery of power to NSW pumps (not possible during the event; and therefore, not credited), core damage could have occurred. The detailed ASP analysis can be found in the Enclosure.

Sensitive Information Review. 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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ADAMS Accession No.: ML13322A414

OFFICE	RES/DRA/PRB	RES/DRA/PRB	RES/DRA
NAME	C. Hunter	J. Nakoski	R. Correia
DATE	11/18/13	11/18/13	11/25/13

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