

March 7, 2013

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

FROM: Doug H. Coe, Acting Director */RA/*  
Division of Risk Analysis  
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF FINAL CATAWBA NUCLEAR STATION  
UNIT 1 ACCIDENT SEQUENCE PRECURSOR ANALYSIS

This memorandum provides the final results of an accident sequence precursor (ASP) analysis of an operational event that occurred at Catawba Nuclear Station, Unit 1 on April 4, 2012. The analysis has a conditional core damage probability (CCDP) of less than  $1 \times 10^{-4}$ . Therefore, the NRC is not requesting a formal review from the licensee following the ASP analysis review procedures.

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.

CONTACT: Keith Tetter, RES/DRA  
301-251-7605

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

Reactor Trip due to Faulted Reactor Coolant Pump Cable and an Error in Protective Relay Actuation Causes a Subsequent Loss of Offsite Power (April 2012) at Catawba Nuclear Station Unit 1. This event is documented in LER 413/12-001 and Inspection Reports 05000413/2011009 and -010.

Event Summary. At 8:03 pm on April 4, 2012, Catawba Unit 1 experienced a complete loss of offsite power (LOOP) for about five hours and 30 minutes. This condition resulted from a trip of Reactor Coolant Pump 1D which caused a reactor trip and turbine trip. Shortly after the Unit 1 generator power circuit breakers opened, the Zone G Protective Relaying System unexpectedly actuated on an instantaneous under-frequency condition as a result of an error in the relay logic and opened the switchyard breakers thereby isolating Unit 1 from the grid and resulting in a LOOP.

Both emergency diesel generators (EDGs) automatically started and powered their respective essential busses as designed. Approximately five hours and 30 minutes after the event initiated and after confirming that the sources of the fault were cleared, offsite power was restored to Essential Bus 1ETA.

Summary of Analysis Results. This operational event resulted in a CCDP of  $9 \times 10^{-6}$ . The detailed ASP analysis can be found in the Enclosure.

Risk Insights. The risk of the at-power LOOP event was heavily mitigated by the availability of the ability to cross-connect offsite power to a Unit 1 essential bus via the crosstie from Unit 2. The dominant sequence for this analysis involves the LOOP initiating event and postulated station blackout due to the failures of the plant's emergency power system (i.e., EDGs), failure of the turbine-driven auxiliary feedwater pump, and subsequent failure of operators to restore power to a Unit 1 essential bus within 1 hour.

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

Enclosure:  
As stated

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

Reactor Trip due to Faulted Reactor Coolant Pump Cable and an Error in Protective Relay Actuation Causes a Subsequent Loss of Offsite Power (April 2012) at Catawba Nuclear Station Unit 1. This event is documented in LER 413/12-001 and Inspection Reports 05000413/2011009 and -010.

Event Summary. At 8:03 pm on April 4, 2012, Catawba Unit 1 experienced a complete loss of offsite power (LOOP) for about five hours and 30 minutes. This condition resulted from a trip of Reactor Coolant Pump 1D which caused a reactor trip and turbine trip. Shortly after the Unit 1 generator power circuit breakers opened, the Zone G Protective Relaying System unexpectedly actuated on an instantaneous under-frequency condition as a result of an error in the relay logic and opened the switchyard breakers thereby isolating Unit 1 from the grid and resulting in a LOOP.

Both emergency diesel generators (EDGs) automatically started and powered their respective essential busses as designed. Approximately five hours and 30 minutes after the event initiated and after confirming that the sources of the fault were cleared, offsite power was restored to Essential Bus 1ETA.

Summary of Analysis Results. This operational event resulted in a CCDP of  $9 \times 10^{-6}$ . The detailed ASP analysis can be found in the Enclosure.

Risk Insights. The risk of the at-power LOOP event was heavily mitigated by the availability of the ability to cross-connect offsite power to a Unit 1 essential bus via the crosstie from Unit 2. The dominant sequence for this analysis involves the LOOP initiating event and postulated station blackout due to the failures of the plant's emergency power system (i.e., EDGs), failure of the turbine-driven auxiliary feedwater pump, and subsequent failure of operators to restore power to a Unit 1 essential bus within 1 hour.

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

Enclosure:  
As stated

**DISTRIBUTION:**

NON-PUBLIC	HNourbakhsh, ACRS	JMonday, RII (DRS)
PRB R/F	SWeerakkody, NRR	RCroteau, RII (DRP)
DRA R/F	HCruz, NRR	RBernhard, RII (SRA)
BSheron/SWest, RES	HChernoff, NRR	JHanna, RII(SRA)
JGitter/SLee, NRR	RFranovich, NRR	GMacDonald, RII (SRA)
ELeeds/JUhle, NRR	JThompson, NRR (PM)	AHutto, RII (SRI)

**ADAMS Accession No.: ML13060A163**

OFFICE	RES/DRA/PRB	RES/DRA/PRB	RES/DRA
NAME	K. Tetter	G. DeMoss (D.Marksberry for)	D. Coe
DATE	03/01/13	03/01/13	03/05/13