LER 295/82-033

Event Description: Postulated Grid-Related/Weather-Related LOOP with Two EDGs Inoperable

Date of Event: October 15, 1982

Plant: Zion 1

Summary

During normal operation on October 15, 1982 while the 1 B EDG was being tested as a requirement for emergency diesel generator (EDG) 1A being out of service, the EDG tripped on low turbo lubrication oil pressure. The 0 EDG was operable. A unit shutdown commenced due to the two out of three EDGs being inoperable. Investigation revealed that the low pressure was due to clogged filters. The oil and filters were changed and 1B EDG was returned to service. EDG 1B would have started on a safety injection (SI) signal but would have been expected to fail due to a lack of turbocharger lubrication. Zion l has three emergency diesel generators; each rated at 4,000 kW and cooled by service water. Two diesel generators are specifically dedicated to Zion 1. Diesel generator 1A feeds 4-kV bus 148, and diesel generator 2B feeds 4-kV bus 149. One diesel generator (diesel generator 0) is connected to both Zion 1 bus 147 and Zion 2 bus 247. The buses are electrically interlocked to prevent the operation of both buses at the same time. Diesel generator 1A bus 148 supplies auxiliary power to auxiliary feedwater pump 1B, residual heat removal (RHR) pump B, and safety injection pump B. Diesel generator 1B bus 149 supplies auxiliary power to auxiliary feedwater pump 1C, RHR pump A and charging pump A. In addition to the diesel generators, power from the Unit 2 station auxiliary transformer (SAT) can be manually aligned to supply power to Unit 1.

Since auxiliary power can be supplied from Unit 2, plant-centered loss of offsite power (LOOPs) would not be of particular importance in this event. LOOPs that affected both units (i.e., Unit 2 could not provide auxiliary power to Unit 1 given both EDGs were inoperable) such as grid-related and weather-related LOOPs would be of importance given that both dedicated EDGs were inoperable. This event was modeled as a postulated grid-related/weather-related LOOP with two EDGs inoperable. The LOOP frequency, the offsite power recovery probabilities, and the probability of seal loss-of-coolant accident (LOCA) were modified as shown in following table to reflect the values associated with grid-related and weather-related LOOPs (see ORNL/NRC/LTR 89/11, *Revised LOOP Recovery and PWR Seal LOCA Models,* August 1989). The first train of emergency power was set to failed to reflect the failed EDG since it was assumed that the lack of lubrication found in EDG 1 B could also have occurred in the other EDGs. The third train of emergency power was set to unavailable to reflect the unavailability of EDG 1A due to maintenance. The corresponding system trains that rely on these diesels for power given the loss of offsite power were also modified to reflect their unavailability. Since the test done on EDG 1B that resulted in the EDG trip was performed daily while EDG 1A was out of service, the length of time in which both faults were present was assumed to be 24 hours. The increase in core damage probability (CDP), or importance, over the duration of the event is 1.4×10^{-6}. The base-case CDP over the duration of the event is 1.2×10^{-7}, resulting in an estimated conditional core damage probability of 1.5×10^{-6}. The dominant sequence involved a postulated LOOP with emergency power failure (station blackout), a reactor coolant pump (RCP) seal LOCA, and failure to recover offsite power before core uncovery.

Revised LOOP Probabilities

Event	Default Probability	Revised Probability
LOOP frequency	1.6×10^{-5}	2.8×10^{-6}
LOOP short-term non-recovery	0.53	0.66
Seal LOCA probability	0.27	0.42
Offsite power recovery prior to battery depletion given no seal LOCA	0.031	0.14
Offsite power recovery prior to battery depletion given seal LOCA	0.57	0.77
Offsite power recovery within two hours (OFFSITE.PWR.REC/- EP.AND.-AFW)	0.22	0.52
Offsite power recovery within six hours (OFFSITE.PWR.REC/- EP.AND.AFW)	0.067	0.32