

September 27, 2001

MEMORANDUM TO: John A Zwolinski, Director, DLPM:NRR
Thomas R. King, Director, DSARE:RES
Michael E. Mayfield, Director, DET:RES

FROM: Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

SUBJECT: REQUEST FOR REVIEW OF COMMON-CAUSE FAILURE INSIGHTS
REPORTS FOR EMERGENCY DIESEL GENERATORS, PUMPS,
MOTOR-OPERATED VALVES, AND CIRCUIT BREAKERS

Attached for your information and review are four draft reports on common-cause failure (CCF) insights for emergency diesel generators (EDGs), pumps, motor-operated valves (MOVs), and circuit breakers. These reports provide CCF trends and CCF engineering insights for these risk-important components from 1980 through 2000. The insights in these reports have been obtained from the same event data used to obtain quantitative CCF parameter estimates. This study is part of an ongoing program of risk-based analysis of reactor operating experience. This effort is undertaken to systematically identify risk-significant insights and provide feedback to the regulatory process.

To serve the NRC staff more efficiently, the Operating Experience Risk Analysis Branch (OERAB) is streamlining its data collection and analysis activities to provide more up-to-date results that are readily available to the NRC staff. In the future, the information in these reports will be made available through a Web-based operating experience information/data system. In addition, the data and results typically presented in our reliability and component studies, ASP analyses, initiating event studies, and other efforts will be made available through a web page. Therefore, we will not routinely produce hard copy NUREG reports of this nature.

The insights contained in these studies are meant to provide useful information to enhance the risk-informed planning of various inspection activities. These reports include engineering insights that may be used to improve the risk perspective of inspection activities associated with failure causes, coupling factors, detection methods, and subsystems that contribute most to CCF events.

For example, Inspection Manual Chapter 2515 outlines the latest inspection process. Appendix A to this chapter provides an overview of the Baseline Inspection Program, and Appendix B describes the Supplemental Inspection Program. The baseline inspection is contained in Inspection Procedure 71111 and its attachments. Several of these attachments advise the inspector to examine or be aware of conditions that lead to the potential for common-cause failure. They include the following:

CONTACT: Dale Rasmuson (dmr), OERAB:DRAA:RES (301) 415-7571

- Attachment 71111.07 Heat Sink Performance
- Attachment 71111.12 Maintenance Rule Implementation
- Attachment 71111.17 Permanent Plant Modifications
- Attachment 71111.19 Post-Maintenance Testing
- Attachment 71111.20 Refueling and Outage Activities

The following procedures do not reference common-cause failures, but they can certainly be enhanced by an awareness of common-cause failures:

- Attachment 71111.21 Safety System Design and Performance Capability
- Attachment 71111.22 Surveillance Testing

The following inspection procedures are part of the supplemental inspection program:

- Inspection Procedure 93801 Safety System Functional Inspection (SSFI)
- Inspection Procedure 93811 Electrical Distribution System Functional Inspection (EDSFI)

The common-cause failure insights in these reports can help enhance these inspection procedures and inspection plans. We have also attached a summary table containing preliminary high-level CCF insights for these four components.

A cooperative activity is underway between the OERAB and the NRR's Inspection Program Branch (IIPB) to make more effective use of pertinent insights from these other OERAB operating experience reports work in risk-informed inspection activities. OERAB is working with IIPB to develop and test a process to better capture risk-based operating experience insights and update risk-informed inspection activities using operating experience from system and component studies, common-cause failure insights, and accident sequence precursor events. OERAB is ready and willing to assist other users of our operating experience reports as needed.

As noted below, these reports support the strategic goals of maintaining safety; improving regulatory effectiveness, efficiency, and realism; reducing unnecessary burden; and increasing public confidence. We briefly summarize them below as they pertain to the Agency's strategic goals.

Maintaining Safety

These reports contain occurrence rate trends in time of CCF events and complete CCF events that could be useful for determining whether safety is improving, deteriorating, or remaining constant in light of both Agency and licensee safety initiatives.

- The trends in the yearly occurrence rates for all CCF events for the four component types are decreasing and statistically significant.
- About 32 percent of the plants have not experienced a CCF event involving the EDG. Approximately 34 percent of the plants have experience only one event

during the study period. Less than 4 percent of the plants have experienced four or more EDG CCF events.

Regulatory Effectiveness and Efficiency

The results, findings, and information in these insights reports are intended to support plant inspections. They provide information for risk-informed inspection activities to enhance the use of inspection resources. The reports indicate the most important causes of failure, detection methods, subsystems and/or subcomponents.

- The dominant failure mode was fail to run for EDGs (56 percent) and pumps (54 percent). Fail to open was the dominant failure mode for MOVs (59 percent) and circuit breakers (54%).
- For EDGs, 66 percent of the events were detected through testing while inspection and maintenance detected 27 percent of the events. Only 10 percent were discovered during an actual demand. This is as expected considering the extensive and frequent surveillance test requirements for EDGs contained in Technical Specifications. Similarly, 58 percent of the circuit breaker CCF events were detected by testing. Over 20 percent were discovered during an actual demand. Inspection and maintenance accounted for the other 20 percent of the events.
- In contrast, only 35 percent of the pump CCF events 40 percent of the MOV CCF events were detected by testing. Thirty percent of the pump CCF events and 39 percent of the MOV CCF events were detected by an actual demand. Inspection and maintenance account for the remaining 21 percent for both pumps and MOVs.
- A review of the MOV CCF events by dates shows that, prior to 1990, 35 percent of the events were discovered by Testing and 45 percent by Demands. Since 1990, 59 percent have been discovered by Testing and 27 percent by Demands. This tends to confirm the effectiveness of the impact of Generic Letter 89-10 and its follow-on activities.
- The largest number of events (30 percent of the CCF events) affected the instrumentation and control (I&C) sub-system. The breaker, cooling, engine, fuel oil, and generator are significant contributors. Together, these five sub-systems are involved in over 80 percent of the EDG CCF events. The battery, exhaust, and lubricating oil sub-systems are minor contributors.

Reducing Unnecessary Burden

These reports include engineering insights and associated information that may be used to focus inspection activities on the more-important areas identified by the CCF experience.

Ensuring Public Confidence

These reports demonstrate the Agency's ability to analyze operating experience independently of licensee-sponsored activities. These independent assessments allow the Agency to determine whether licensee assessments of risk and risk-informed activities are reasonable.

We are specifically interested in your review of:

- The technical adequacy of data, specifically during the 1996-1998 update period,
- The appropriateness of the risk-important findings, and
- How the information contained in the report can be presented to better help you in your risk-informed regulatory activities.

It is our understanding that NRR will coordinate the review by and receipt of comments from the regions.

We appreciate receiving comments by 60 days from the receipt of this memorandum. If you have any questions regarding these reports, please contact Dr. Dale Rasmuson (301-415-7571) of my staff.

Attachments: As stated

cc w/att.:

R. Zimmerman/A. Thadani, RES

S. Collins, NRR

J. Johnson, NRR

B. Sheron, NRR

R. Borchardt, NRR

Memorandum Dated: / /01

SUBJECT: REQUEST FOR REVIEW OF COMMON-CAUSE FAILURE INSIGHTS REPORTS FOR EMERGENCY DIESEL GENERATORS, PUMPS, MOTOR-OPERATED VALVES, AND CIRCUIT BREAKERS

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2. Steve Mays - Concur					
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4. Scott Newberry - Concur/Signature					
5. Nancy - Please Distribute and send 15 copies of the reports to Mike Markley of the ACRS - Fill in Template Number and Accession Number					
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