

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, DC 20555-0001

July 30, 1998

NRC ADMINISTRATIVE LETTER 98-04: AVAILABILITY OF COMMON-CAUSE FAILURE  
DATABASE

Addressees

All holders of operating licenses for nuclear power reactors, except those licensees who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this administrative letter to notify nuclear power reactor licensees of the availability of a common-cause failure (CCF) database, CCF analysis software, and associated technical reports. This administrative letter does not transmit any new requirements or staff positions. No specific action or written response is required.

Background

CCFs have been identified as significant contributors to system failure probability and accident sequence core damage frequency in most probabilistic risk assessments (PRAs) since the Reactor Safety Study (WASH-1400). They are also important contributors in the individual plant examinations (IPEs).

A CCF event consists of component failures that meet four criteria: (1) two or more individual components fail or are degraded, including failures during demand, failures during inservice testing, or deficiencies that would have resulted in a failure if a demand signal had been received; (2) components fail or are degraded within a selected period, such that success of the PRA mission would be uncertain; (3) component failures result from a single shared cause and coupling mechanism; and (4) a component failure occurs within the established component boundary.

An approach to performing plant-specific CCF analyses was developed jointly by NRC and the Electric Power Research Institute in the late 1980s. The approach is documented in NUREG/CR-4780, *Procedures for Treating Common Cause Failures in Safety and Reliability Studies*, Volumes 1 and 2. These documents gave relatively little guidance on the analysis of data. Furthermore, the data required for application of the approach were not generally available in a readily accessible form. Each application involved significant prescreening of a large amount of data by each analyst using the approach.

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In the past, the majority of CCF analyses performed in support of PRAs have used generic estimates for CCF parameters. Some have used the methods of NUREG/CR-4780 but produced widely varying results because of differences in the individual analysts' screening of industry data derived primarily from the licensee event reports (LERs).

### Discussion

In response to these deficiencies related to CCF data, the NRC's Office for Analysis and Evaluation of Operational Data (AEOD) and the Idaho National Engineering and Environmental Laboratory have developed a CCF database and analysis software package to aid in this aspect of system reliability analyses and related risk-informed applications. The CCF Database provides guidance on the screening and interpretation of data and contains relevant event data to provide a more uniform and cost-effective way of performing CCF analyses.

Documentation of the database is presented in four volumes: "Overview," "Event Definition and Classification of Common-Cause Failure Events," "Data Collection and Coding Common-Cause Failure Events," and "Common-Cause Failure Database and Analysis Software Reference Manual." These technical reports are published as NUREG/CR-6286, "Common-Cause Failure Database and Analysis System."

The principal products of this CCF data collection and analysis system are the method and guidelines for identifying, classifying, and coding CCF events; the CCF database containing both CCF events and an estimate of independent failure counts; and the CCF parameter estimation software.

The CCF event identification process includes reviewing failure data to identify CCF events and counting independent failure events. The process allows the analyst to consistently screen failures and identify CCF events. The CCF event coding process provides guidance for the analyst to consistently code CCF events. Additionally, the CCF events are stored in a format that allows PRA analysts to review the events and develop an understanding of how they occurred.

The database contains CCF-related events that have occurred in U.S. commercial nuclear power plants from 1980 through 1995. The events were identified from failure reports in the Nuclear Plant Reliability Data System (NPRDS), which is a proprietary database maintained by the Institute of Nuclear Power Operations (INPO), and LERs obtained from the Sequence Coding and Search System (SCSS) database maintained by the Oak Ridge National Laboratory for the NRC. The current data collection effort has separated the data by system as well as by component type.

The CCF analysis software uses the impact vector method demonstrated in NUREG/CR-4780. The basic information needed for understanding and coding a CCF event is based on the physical characteristics of the event and is recorded in fields in the database. The database software allows an analyst to tailor the assessment of these parameters for plant-specific analyses.

The interpretation of the degree of impact of the CCF events on affected components is a somewhat subjective process. Impact interpretations contained in the database are clearly documented for each event. In addition, the analysis software provides the opportunity for analysts to review and modify these evaluations when performing plant-specific CCF analyses. The CCF parameters estimated by the database software are conditional on these particular interpretations. Therefore, the NRC will continue to review CCF analyses used in regulatory applications on a case-by-case basis. The use of the CCF database should help to make the analyses easier to properly perform and more scrutable during the review process.

Because NPRDS data are proprietary, AEOD by a separate letter will be providing the CCF database and the CCF analysis software, along with supporting technical documentation, to only nuclear power plant licensees who are members of INPO. Copies of NUREG/CR-6286 may be obtained from the Public Document Room or from the Superintendent of Documents. Any questions should be directed to the contact listed below.

  
for Jack W. Roe, Acting Director  
Division of Reactor Program Management  
Office of Nuclear Reactor Regulation

Contact: Dale M. Rasmuson, AEOD  
301-415-7571  
Email: dmr@nrc.gov

Attachment: List of Recently Issued NRC Administrative Letters

LIST OF RECENTLY ISSUED  
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Administrative Letter No.	Subject	Date of Issuance	Issued to
96-05, Rev. 1	Compliance with the Rule "Timeliness in Decommissioning of Material Facilities"	07/14/98	All material and fuel cycle licensees
98-03	Operating Reactor Licensing Action Estimates	05/6/98	All power reactor licensees
98-02	Revision of Event Reporting Guidelines for Power Reactors	03/17/98	All holders of operating licenses for nuclear reactors
98-01	Maintenance Rule Information Available on the NRC Home Page	02/20/98	All holders of operating licenses for nuclear reactors.
97-04	NRC Staff Approval for Changes to 10 CFR, Part 50, Appendix H, Reactor Vessel Surveillance Specimen Withdrawal Schedules	09/30/97	All holders of operating licenses for nuclear power reactors except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
97-03	Plant Restart Discussions Following Natural Disasters	03/28/97	All holders of OLs or CPs for nuclear power reactors
97-02	Elimination of National Examination Schedule for Operator Licensing	03/06/97	All holders of OLs or CPs for nuclear power reactors
97-01	State Initiatives to Legalize Schedule 1 Drugs	01/17/97	All holders of OLs or for nuclear power reactors and all licensees authorized to possess or transport Category 1 nuclear material
96-05	Compliance with the Rule "Timeliness in Decommissioning of Material Facilities"	11/05/96	All material and fuel cycle licensees

OL = Operating License  
CP = Construction Permit

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