

December 24, 2002

MEMORANDUM TO: Mark A. Cunningham, Chief  
Probabilistic Risk Analysis Branch  
Division of Risk Analysis & Applications

FROM: Alan S. Kuritzky **/RA/**  
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SUBJECT: OCCURRENCES OF "SINGLE FAILURE" IN 10 CFR PART 50

In June 2000, Les Lancaster concatenated a Corel Wordperfect version of 10 CFR Part 50 by individually copying over the "html" files for each section in 10 CFR Part 50 available from the NRC web site. I searched this file for all occurrences of the phrase "single failure." The locations of the phrase "single failure" in 10 CFR Part 50 (including appendices) are summarized in the following table. Note, for some functions (e.g., reactivity control and containment isolation), redundancy requirements are explicitly provided in the regulations without referring to a "single failure" (e.g., GDC 26 specifies the need for two independent reactivity control systems, and GDC 56 specifies the acceptable containment isolation valve configurations).

Location	Title of Part, Appendix, or GDC	Description of Use
50.2	Definitions	Contained in the definition of "station blackout"
50.34(f)(3)(vi)	Contents of applications; technical information	Provides for redundant dedicated containment penetrations for connecting external hydrogen recombiners to the containment atmosphere
50.44(c)(3)(ii)(A) and (B)	Standards for combustible gas control system in light-water-cooled power reactors	For containment penetrations used for external recombiners, (A) provides for redundancy for the purpose of containment isolation, and (B) provides for redundancy for the purposes of containment isolation and operation of the external recombiners or purge/repressurization systems

Location	Title of Part, Appendix, or GDC	Description of Use
50.49(e)(3)	Environmental qualification of electric equipment important to safety for nuclear power plants	Used to establish the most severe chemical spray environment from the spray system, if the chemical spray composition can be affected by equipment malfunctions
Appendix A (Table of Contents)	General Design Criteria for Nuclear Power Plants	Included in Table of Contents, under "Definitions"
Appendix A (Introduction)	General Design Criteria for Nuclear Power Plants	Indicates that the conditions under which a single failure of a passive component in a fluid system should be considered are under development
Appendix A (Definitions and Explanations)	General Design Criteria for Nuclear Power Plants	Provides definition of "single failure" (Footnote [2] also states that single failures of passive components in electrical systems should be assumed in designing against single failures, but that the conditions under which a single failure of a passive component in a fluid system should be considered are under development )
Appendix A, GDC 17	Electric power systems	Establishes single failure criterion for onsite electric power supplies and distribution system
Appendix A, GDC 21	Protection system reliability and testability	Establishes single failure criterion for the protection system
Appendix A, GDC 34	Residual heat removal	Establishes single failure criterion for the residual heat removal system
Appendix A, GDC 35	Emergency core cooling	Establishes single failure criterion for the emergency core cooling system
Appendix A, GDC 38	Containment heat removal	Establishes single failure criterion for the containment heat removal system
Appendix A, GDC 41	Containment atmosphere cleanup	Establishes single failure criterion for containment atmosphere cleanup systems
Appendix A, GDC 44	Cooling water	Establishes single failure criterion for cooling water systems used to transfer heat from systems important to safety to an ultimate heat sink

Location	Title of Part, Appendix, or GDC	Description of Use
Appendix K(I)(A)	ECCS Evaluation Models	Establishes single failure criterion for determining the limiting power distribution assumed as part of the required and acceptable features of the evaluation model
Appendix K(I)(D)	ECCS Evaluation Models	Establishes single failure criterion for evaluation of post-blowdown heat removal by the ECCS
Appendix R(III)(L)(6)	Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979	Establishes that single failure criterion does <b>not</b> apply to shutdown systems installed to ensure post-fire shutdown capability

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