

MEMORANDUM

TO: J. T. Larkins
FROM: J. N. Sorensen *JNS*
DATE: August 11, 1998
SUBJECT: NEI Approach To Making Part 50 Risk Informed

At Dr. Powers' request, I have been spending some time on the question of how the NRC's current body of regulations might be modified to make it more risk informed. During the process of collecting relevant background information, I called Tony Pietrangelo at NEI, who suggested I talk to Steve Floyd. Steve had conducted (or perhaps directed) an examination of Part 50 to identify modifications which would make the regulations more risk informed and performance based. He offered to send us a copy of the resulting matrix of changes, which is attached to this memorandum.

The approach NEI is suggesting essentially modifies the scope of Part 50 by limiting the number of plant components that it touches. This would be accomplished by limiting the applicability of certain sub-sections of Part 50 to those systems or components which are shown by a probabilistic risk assessment to be significant to public health and safety. Specific suggestions are identified in the attached matrix.

NEI has offered to make a presentation to the ACRS on their proposed changes and on a scheme they have suggested to the staff for testing the modified regulatory structure.

From: "FLOYD, Steve" <sdf@nei.org>
To: "jns@nrc.gov" <jns@nrc.gov>
Date: 7/21/98 4:28pm
Subject: Part 50 risk changes

Jack,

It was good talking to you on this subject. I hope we figure some way to move risk applications forward because I believe they do improve plant safety. Let me know if ACRS desires a presentation/discussion of this matrix and our "radical" approach with an ANPR to test it out.

Steve

**“Road Map” For Transforming Current Regulations
to a Risk-Informed, Performance-based Regulation Approach**

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
50.12	Specific exemptions	10 CFR 50.12(2), special circumstances, does not include provisions for considering risk and operating experience.	Add a new item 50.12 (2) (vii) that would allow exemptions for requirements, shown on the basis of risk insights and operating experience, to be of low safety value.
50.36	Technical specifications	10 CFR 50.36(b) requires that tech specs be derived from the safety analyses contained in the FSAR. FSAR safety analyses are deterministic.	Revise 10 CFR 50.36 (b) to allow tech specs to be based on risk insights and operating experience.
50.44	Combustible gas control	10 CFR 50.44(a)(3)(ii) requires all reactors that rely on purge systems to control hydrogen install hydrogen recombiners, irrespective of the containment volume and the likelihood for having an explosive concentration of hydrogen.	Revise 50.44 to require hydrogen recombiners only if hydrogen concentration based on the percentage of oxidized cladding exceeds 50% of the explosive limit.
50.46	ECCS	10 CFR 50.46 (a) (1) (i) 10 CFR 50.46(c) defines a LOCA as a break in pipes in the RCS pressure boundary up to and including a break equivalent in size to the double-ended rupture of the largest pipe in the RCS.	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.
50.47	Emergency planning	10 CFR 50.47(c)(2) generally establishes an exposure pathway EPZ of 10 miles and an ingestion pathway EPZ of 50 miles.	Define exposure and ingestion pathway EPZs in terms of a realistic source term, site demography and the safety goals.

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
50.49	Environmental qualification	10 CFR 50.49(b) – Regulation applies to equipment that is important to safety as defined in 10 CFR 50.49 (b)(1) and (2). Definitions are based on deterministic, design basis events.	Re-define safety-related and important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) “A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.”
50.54	Conditions of Licenses	10 CFR 50.54(a)(3) requires prior NRC approval to reduce commitments in the QA plan.	Limit scope to those commitments related to the performance of risk-significant SSCs.
50.55a	Codes and Standards	10 CFR 50.55a (a)(1) requires SSCs to be tested and inspected commensurate with importance of the safety functions to be performed.	Define safety importance consistent with 10 CFR 50.36 (c)(2)(ii)(D) “A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.”
50.55a	Codes and Standards	10 CFR 50.55a (f)(1) requires in-service testing for safety-related pumps and valves.	Re-define safety-related and important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) “A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.”

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
50.55a	Codes and Standards	10 CFR 50.55a (f)(4)(i) and (4)(ii) requires code testing of pumps and valves required for safety be conducted in accordance with the latest edition of the ASME code.	Re-define pumps and valves required for safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) “A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.”
50.55a	Codes and Standards	10 CFR 50.55a(g)(1) and (2) requires inservice examination of safety-related components in accordance with latest addenda of ASME code.	Re-define safety-related consistent with 10 CFR 50.36 (c)(2)(ii)(D) “A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.”
50.59	Changes, tests and experiments	10 CFR 50.59 (a)(1) focuses on changes as described in the safety analysis report.	Revise 50.59 (a)(1) to change the scope consistent with 10 CFR 50.36 (c)(2)(ii)(D) “A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.”
50.59	Changes, tests and experiments	10 CFR 50.59 (a)(2) provides criteria for determining if a change is an unreviewed safety question. The criteria is not risk-informed.	Define risk-informed thresholds for determining if a change is an unreviewed safety question.

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
50.59	Changes, tests and experiments	10 CFR 50.59 (c) references facility as described in safety analysis report.	Revise paragraph (c) consistent with paragraph (a)(1).
50.65	Requirements for monitoring the effectiveness of maintenance at nuclear power plants	10 CFR 50.65 (3)(b) defines the scope of the maintenance rule. The scope is not risk-informed.	Revise 50.65(3)(b) to change the scope consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
50.72	Immediate notification requirements	10 CFR 50.72 (b)(1)(ii), (iii) and (vi) requires one-hour reporting of conditions that pose an actual threat to safety.	Define threat to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
50.72	Immediate notification requirements	10 CFR 50.72(b)(2)(i) requires four hour reporting of events that significantly compromise plant safety	Define significant compromise to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
50.72	Immediate notification requirements	10 CFR 50.72 (b)(2)(iii) requires a four hour report for any condition that could have prevented the fulfillment of a safety function.	Define safety function consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
50.73	Licensee event report system	10 CFR 50.73(a)(2)(ii) requires a written report for events that significantly compromise plant safety	Define significant compromise to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
50.73	Licensee event report system	10 CFR 50.73 (a)(2)(iii) and (x) requires a written report of conditions that pose an actual threat to safety.	Define threat to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

50.73	Licensee event report system	10 CFR 50.73 (a)(2)(v) requires a written report for any condition that could have prevented the fulfillment of a safety function.	Define safety function consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
10 CFR Regulation	Subject	Problematic Language	Recommended Fix
GDC 1	Quality standards and records	Requires that SSCs important to safety be designed, fabricated, erected and tested to quality standards commensurate with safety importance of functions to be performed.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
GDC 2	Design bases for protection against natural phenomena	Requires that SSCs important to safety be designed to withstand the effects of natural phenomena.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

GDC 3	Fire protection	Requires that SSCs important to safety be designed and located to minimize the probability and effect of fires and explosions.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
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10 CFR Regulation	Subject	Problematic Language	Recommended Fix
GDC 4	Environmental and dynamic effects design bases	Requires that SSCs important to safety be designed to be compatible with the effects associated with normal operation and postulated accidents, including LOCA.	<p>Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."</p> <p>Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.</p>
GDC 5	Sharing of SSCs	Requires that SSCs important to safety not be shared among nuclear units unless such sharing can be shown to not impair safety functions.	<p>Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."</p>

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
GDC 13	Instrumentation and control	Requires that instrumentation be provided to monitor variables during normal operation, anticipated occurrences and accident conditions to assure adequate safety.	Define adequate safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
GDC 16	Containment design	Requires that containment design conditions important to safety are not exceeded during postulated accident conditions.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
GDC 17	Electric power systems	Requires that onsite and offsite electrical systems be provided to permit functioning of SSCs important to safety.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
GDC 17	Electric power systems	Requires that one circuit be available within a few seconds following a LOCA.	Change to be available within a time sufficient to maintain functions important to safety for likely pipe break spectrums.
GDC 18	Inspection and testing of electric power systems	Requires that electric power systems important to safety be designed to permit periodic inspection and testing of important areas and features.	Define important to safety and important features consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
GDC 19	Control room	Requires that control room be operable and habitable under LOCA conditions.	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.
GDC 20	Protection system functions	Requires that the protection system be designed to sense accident conditions and initiate operation of systems important to safety.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
GDC 30	Quality of reactor coolant pressure boundary	Requires that components part of the reactor coolant pressure boundary be designed, fabricated, erected and tested to the highest standards practical.	Revise to test consistent with their importance to safety.
GDC 35	Emergency core cooling	Requires a system to transfer heat from the core following any loss of coolant accident...	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.
GDC 38	Containment heat removal	Requires a system to rapidly reduce containment pressure and temperature following any LOCA	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.
GDC 44	Cooling water	Requires a system to transfer heat from SSCs important to safety to the ultimate heat sink.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
GDC 46	Testing of cooling water system	Requires system to be designed such that testing at conditions as close as possible to the design conditions, including LOCA, can be performed.	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.

GDC 50	Containment design basis	Requires containment and associated systems to be capable of maintaining containment integrity for any LOCAs	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.
10 CFR Regulation	Subject	Problematic Language	Recommended Fix
GDC 54	Piping systems penetrating containment	Requires piping systems that penetrate containment to have various capabilities that reflect the importance to safety of isolating these piping systems.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
GDC 55	Reactor coolant pressure boundary penetrating containment	Requires that other requirements not specifically identified in the GDC to minimize the probability or consequences of accidental rupture of these lines be provided as necessary to assure adequate safety.	Define adequate safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

GDC 61	Fuel storage and handling and radioactivity control	Requires that fuel storage and handling systems be designed with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and residual heat removal.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
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10 CFR Regulation	Subject	Problematic Language	Recommended Fix
Appendix B - Introduction	Quality assurance	States that Appendix B applies to all activities affecting safety-related SSCs.	Re-define safety-related consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
Appendix B - Criterion I	Organization	Requires that the authority and duties of persons and organization performing activities affecting the safety-related functions of SSCs be clearly established and delineated in writing.	Re-define safety-related consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
Appendix B - Criterion II	Quality Assurance Program	Requires that the QA program provide controls over activities affecting the quality of SSCs to an extent consistent with their importance to safety.	Define importance to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
Appendix B - Criterion III	Design Control	Requires that measures be established for the selection and review for suitability of application of materials. Parts, equipment, and processes that are essential to the safety-related functions of the SSCs.	Re-define safety-related consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
Appendix B - Criterion XVI	Corrective Actions	Requires that the cause of significant conditions adverse to quality be determined and corrective action to preclude repetition be identified and documented.	Define a significant condition consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
Appendix E	Emergency Planning and Preparedness	Appendix E generally establishes an exposure pathway EPZ of 10 miles and an ingestion pathway EPZ of 50 miles.	Define exposure and ingestion pathway EPZs in terms of a realistic source term, site demography and the safety goals.
Appendix K	ECCS Evaluation Models	Appendix K (c)(1) requires LOCA analyses to include instantaneous double ended guillotine and longitudinal breaks of the largest diameter reactor coolant pipe.	Define LOCA in terms of a likely pipe break size spectrum based on risk insights and operating experience.

10 CFR Regulation	Subject	Problematic Language	Recommended Fix
Appendix R	Fire protection	This regulation makes extensive use of the terms "important to safety" and "safety-related" to define the scope of equipment to which this regulation applies.	Define important to safety and safety-related consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."
Appendix S	Earthquake engineering criteria for nuclear power plants	This regulation applies to plants licensed after 1/10/97. It requires that SSCs important to safety be able to withstand the effects of earthquakes without loss of safety function.	Define important to safety consistent with 10 CFR 50.36 (c)(2)(ii)(D) "A structure, system or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."