

United States Nuclear Regulatory Commission
Office of Public Affairs
Washington, DC 20555
Phone 301-415-8200 Fax 301-415-2234
Internet: opa@nrc.gov

No. 96-63

FOR IMMEDIATE RELEASE
(Friday, April 26, 1996)

NOTE TO EDITORS:

The Nuclear Regulatory Commission has received four attached reports from its Advisory Committee on Reactor Safeguards (ACRS). The reports, in the form of letters, provide comments on:

--Proposed revisions to NRC regulations and regulatory guides relating to reactor site criteria.

--A probabilistic risk assessment (PRA) document, its pilot applications, and the next steps to expand the use of PRA in the regulatory decision-making process.

--Westinghouse Electric's best-estimate computer code for a large-break loss-of-coolant accident.

--Continued need for U.S. membership in the Nuclear Energy Agency, a part of the Organization for Economic Cooperation and Development.

#

Attachments:
As stated

April 22, 1996

The Honorable Shirley Ann Jackson
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: PROPOSED REVISIONS TO 10 CFR PARTS 50 AND 100 AND
PROPOSED REGULATORY GUIDES RELATING TO REACTOR SITE
CRITERIA

During the 430th meeting of the Advisory Committee on Reactor Safeguards, April 11-13, 1996, we reviewed the proposed revisions to reactor siting regulations and associated Regulatory Guides and Standard Review Plan sections. Our Subcommittee on Extreme External Phenomena reviewed this matter during a meeting on April 3, 1996. During this review, we had the benefit of discussions with representatives of the NRC staff, Westinghouse Electric Corporation, and the Nuclear Energy Institute. We also had the benefit of the document referenced.

The staff has proposed final revisions to 10 CFR Parts 50 and 100 and a new Appendix S to Part 50 that deal with both seismic and source term issues for future plants and sites. Many of the implementation details will be found in new Regulatory Guides and in Standard Review Plan sections. The existing requirements of 10 CFR Part 100 and its Appendix A will remain in effect for operating plants.

We recommend that the proposed final rule dealing with the seismic aspects be issued.

The proposed final rule requires that any individual, located at any point on the exclusion area boundary for any two-hour period following the postulated release of the fission products, not receive a radiation dose in excess of 25 rem total effective dose equivalent (TEDE). Similarly, an individual located at the outer boundary of the low population zone (LPZ), who is exposed to the radioactive cloud resulting from the release of the postulated fission products (during the entire period of its passage), not receive a dose in excess of 25 rem TEDE. Consistency within the body of NRC regulations is most desirable. We recommend that careful definitions of the TEDE limits that are mindful of organ dose weighting factors found in 10 CFR Part 20 be included in the final rule.

Radiological doses are to be evaluated over a two-hour period. The proposed final rule states that the evaluation should be over the two-hour period of maximum dose. The Office of Nuclear Regulatory Research (RES) has a differing view and recommends that the proposed final rule be modified from any two-hour period after release of fission products (referred to as the "worst" two hours) to a period of two hours commencing with fuel failure (referred to as the "first" two hours). RES believes that the use of the worst two-hour period in the dose calculation is not justified by risk considerations and could lead to increased costs for future licensees with no commensurate gain in safety.

The staff supporting the proposed rule states that (1) the proposed licensing framework would provide a relaxation of engineered safety feature (ESF) performance requirements commensurate with updated source term and radiological insights, (2) the regulatory requirements for determination of in-containment radioactive material during the two-hour dose evaluation period would be consistent and capable of handling designs substantially different from those analyzed in NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," (3) the analysis would be easy to perform and reproducible with confidence, and (4) the technical bases and analytical methods would be defensible. While the revised dose evaluation in 10 CFR 50.34 is intended for future plants, the staff is concerned that a current licensee might seek to use it to remove or disable existing fission product cleanup systems. This could markedly change the risk profile of the plant from that which was licensed.

We are not persuaded by the rationale provided by RES in favor of the first two-hour dose calculation. We agree with the position taken in the proposed final rule, and recommend that the rule and the associated Regulatory Guides and SRP sections be issued.

Sincerely,

/s/

T. S. Kress
Chairman, ACRS

REFERENCE:

Memorandum dated March 6, 1996, from T. P. Speis, Office of Nuclear Regulatory Research, NRC, to J. T. Larkins, ACRS, transmitting Revisions to 10 CFR Part 100, Reactor Site Criteria, Revisions to 10 CFR Part 50, New Appendix S to Part 50 (Final Rules) and Associated Regulatory Guides and Standard Review Plan Sections

April 23, 1996

The Honorable Shirley Ann Jackson
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: PROBABILISTIC RISK ASSESSMENT FRAMEWORK, PILOT
APPLICATIONS, AND NEXT STEPS TO EXPAND THE USE
OF PRA IN THE REGULATORY DECISION-MAKING PROCESS

During the 430th meeting of the Advisory Committee on Reactor Safeguards, April 11-13, 1996, we continued our deliberations on risk-informed and performance-oriented regulation (RIPOR). We met with representatives of the NRC staff and the Nuclear Energy Institute (NEI) during our 429th meeting on March 7-9, 1996. Our Subcommittee on Probabilistic Risk Assessment (PRA) also met on October 26-27, 1995, with representatives of the NRC staff and of the nuclear industry, and on February 27-28, 1996, with the NRC staff and two invited experts, Dr. D. M. Karydas (performance-based standards for fire protection) and Professor T. G. Theofanous (on the proper formulation of safety goals and assessment of safety margins for rare and high-consequence hazards). We also had the benefit of the documents referenced.

This report is in response to the Staff Requirements Memorandum dated December 27, 1995, in which the Commission requested "ACRS views on the PRA framework document, its relationship to the pilot applications (SECY-95-280), and the next steps in the process to expand the use of PRA in the regulatory decision-making process."

PRA Framework Document

The PRA framework document provides a good starting point in the development of RIPOR. The six-step process described in the document is a reasonable way to proceed. We agree with the staff that the focus should be on the integration of probabilistic and deterministic approaches to regulation.

The PRA framework document, however, does not articulate an overall philosophy for RIPOR. We believe that such a philosophy should be developed. Some important high-level principles that should be included are:

1. RIPOR should consider risk from all modes of nuclear plant operations, including full power, shutdown, and transition.
2. The Commission's safety goals should serve as the top-level acceptance criteria.

3. Subsidiary performance-based acceptance criteria should be determined in a consistent way and must be measurable or calculable. The licensee should be granted flexibility in choosing the means to meet the criteria.
4. The relationship between RIPOR and defense-in-depth should be explained. The role of defense-in-depth in the determination of performance criteria to accommodate uncertainty and incompleteness in risk assessments should be established.
5. Criteria for the adoption of prescriptive regulations should be clearly delineated.
6. The acceptance criteria should be set at the highest level of plant system hierarchy that is consistent with the other principles noted above.

Discussion

It is indicative of the novelty of these concepts that we have spent a considerable amount of time discussing the meaning of "performance" among ourselves and with the staff and NEI. Some interpret performance in a limited way; i.e., its measures are simply the reliability and availability (or related quantities) of plant systems and components. Others take a broader view and interpret it as the overall performance of the licensee, including operations, maintenance, training, and the prevailing safety culture at the plant.

Similarly, the definition of performance criteria varies widely. At one extreme, we have simple measures that are either directly measurable or that involve calculations (e.g., the reliabilities and unavailabilities mentioned above). At the other extreme, performance criteria can be probabilistic or nonprobabilistic and can be set at any level. Observations and statistical or experimental evidence from the plant or other sources in conjunction with models can be used to demonstrate that the criteria have been met. As part of an overall philosophy, the staff needs to resolve the ambiguity in the definition of performance criteria.

Pilot Applications

While we support the staff's use of pilot applications, we are concerned that there seems to be no integrated justification for their selection. We would like to see the development of a list of important issues that are expected to arise on the road to RIPOR,

along with a discussion of how the selected pilot projects will help. The staff has agreed to look into these issues.

We also recommend that, for each pilot project, attempts be made to establish performance-based decision criteria along with the methods that would be used for demonstrating compliance. Such an exercise should provide useful insights regarding the overall feasibility of a performance-oriented approach to regulation.

Next Steps to Expand the Use of PRA in the Regulatory Decision-making Process

We believe that the NRC needs to take a number of important additional steps before a RIPOR environment can be achieved. These are discussed below.

Safety Goals

A restatement of the Commission's safety goal policy is needed that will allow the use of safety goals on a plant-specific basis.

Performance-Based Regulatory Criteria

A methodology is needed to determine performance-based criteria for regulatory action that are consistent with the top-level safety goals, as stated in the high-level principles. A "top-down" approach will ensure that this happens. An important element should be the preservation of the concept of defense-in-depth. The development of this methodology will also provide the opportunity to reexamine the validity of Level 2 subsidiary goals, which appear to be controversial at this time.

Programmatic Issues

Developing a RIPOR system should be a participative effort between the staff and the industry. We believe that the magnitude and significance of the task that the staff has undertaken requires a cooperative effort. Also, we recommend that the staff work with foreign researchers and regulatory agencies.

Conclusion

The intellectual and practical issues that the staff must confront in developing a RIPOR structure are significant. The staff has made a good start, but much remains to be done. We are pleased that the staff has agreed to meet with us periodically. Recent meetings have demonstrated that the staff is receptive to suggestions on how to deal with these complex issues. We applaud this attitude. We will keep you informed as these efforts progress.

Additional comments by ACRS Members Thomas S. Kress and Don W. Miller are presented below.

Sincerely,

/S/

T. S. Kress
Chairman, ACRS

Additional Comments by ACRS Members Thomas S. Kress and Don W. Miller

While we agree with most of the Committee's report on this subject, we find it to lack coherence. The major problem we have with the Committee report is its treatment of the concept of "performance-based" regulation. We conceive of basically two meanings to the word "performance" in this context: (1) the performance of equipment (systems and components) in carrying out the intended function, or (2) the performance of the licensee in performing its function (operation, maintenance, inspection, training, etc.). The first of these could further relate to either the operability of the specific equipment (e.g., does it turn on or off, and, in the case of a pump, for example, does it provide the required flow) or to the reliability/availability of the equipment. In our view, the former does not provide any basis on which to develop a regulatory structure (there are no meaningful acceptance criteria that relate to risk). On the other hand, the latter can clearly be anchored in risk. This, however, would be purely risk-based regulation. The word "performance" in this context becomes synonymous with "risk" and such a regulatory concept should be designated as risk-based and should not be called performance-based.

The second possible meaning of performance, the performance of the licensee, obviously has a nexus to risk. This connotation of performance, however, is what we have been calling organizational factors. To date, a methodology has not been developed by which objective performance measures can be identified and be factored directly into PRA to quantify risk implications. Therefore, at this time, we do not have the capability to develop such performance-based regulations in any coherent manner. This would, however, be an area worth pursuing in the future with additional research.

This leads us to our main point. At this time, we should be striving for risk-based or risk-informed regulations and should relegate the concept of "performance" regulation to being a remote possibility that needs substantial research to determine feasibility.

References:

1. Memorandum dated December 27, 1995, from J. Hoyle, Secretary of NRC, to J. Larkins, ACRS, Subject: Staff Requirements Memorandum dated December 27, 1995
2. Memorandum dated June 16, 1995, from A. Bates, Office of the Secretary, NRC, to File, Subject: Staff Requirements Memorandum dated June 16, 1995
3. Letter dated February 6, 1996, from J. Milhoan, Office of the Executive Director for Operations, NRC, to W. Rasin, Nuclear Energy Institute, Subject: Improving the Regulatory Process through Risk-Based and Performance-Based Regulation
4. Letter dated January 3, 1996, from J. Taylor, Executive Director for Operations, NRC, to Chairman Jackson, NRC, Subject: Improvements Associated With Managing the Utilization of Probabilistic Risk Assessment (PRA) and Digital Instrumentation and Control Technology
5. Letter dated November 30, 1995, from Chairman Jackson, NRC, to J. Taylor, Executive Director for Operations, NRC, Subject: Follow-up Requests in Probabilistic Risk Assessment and Digital Instrumentation and Control
6. SECY-95-280, "Framework for Applying Probabilistic Risk Analysis in Reactor Regulation," dated November 27, 1995
7. Letter dated November 14, 1995, from W. Rasin, Nuclear Energy Institute, to J. Milhoan, Office of Executive Director for Operations, NRC, Subject: Draft report, "Improving the Regulatory Process Through Risk-Based and Performance-Based Regulation"

April 19, 1996

The Honorable Shirley Ann Jackson
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: WESTINGHOUSE BEST-ESTIMATE LOSS-OF-COOLANT ACCIDENT
ANALYSIS METHODOLOGY

During the 430th meeting of the Advisory Committee on Reactor Safeguards, April 11-13, 1996, we concluded our review of the best-estimate, large-break, loss-of-coolant accident (LBLOCA) analysis methodology developed by the Westinghouse Electric Corporation. We had previously reviewed this matter during our 428th meeting, February 8-10, 1996. We also had the benefit of the referenced documents.

In our February 23, 1996 report commenting on the results of our initial review, we identified several technical details of the Westinghouse LBLOCA methodology needing further attention and also commented on the adequacy of the documentation. As a result of subsequent discussions with representatives of Westinghouse and the NRC staff during this meeting, we believe that these concerns have been addressed.

ACRS Member George Apostolakis did not participate in the Committee's deliberation of this matter.

Sincerely,

/s/

T. S. Kress
Chairman, ACRS

References:

1. Memorandum dated March 25, 1996, from N. Liparulo, Westinghouse, to Nuclear Regulatory Commission, transmitting information on the resolution of issues related to the review of WCAP-12945-P (Proprietary)
2. Letter dated March 15, 1996, from J. Taylor, Executive Director for Operations, NRC, to T. S. Kress, Chairman, ACRS, Subject: Westinghouse Best-Estimate Loss-of-Coolant Accident Analysis Methodology
3. Report dated February 23, 1996, from T. S. Kress, Chairman, ACRS, to Shirley Ann Jackson, Chairman, NRC, Subject: Westinghouse Best-Estimate Loss-of-Coolant Accident Analysis Methodology

April 17, 1996

The Honorable Shirley Ann Jackson
Chairman
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: CONTINUED NEED FOR UNITED STATES MEMBERSHIP IN THE
NUCLEAR ENERGY AGENCY

The Advisory Committee on Reactor Safeguards has recently learned of the proposed withdrawal of the United States (U.S.) from participation in the Nuclear Energy Agency (NEA), a part of the Organization for Economic Cooperation and Development. The Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) are the primary U.S. technical participants in the NEA activities and, hence, are the agencies that have the most complete understanding of the benefits of membership in NEA. Our comments will perhaps assist you as you set forth the NRC position.

For many years, the NEA Committee on Safety of Nuclear Installations (CSNI) has been an active and productive leader in nuclear reactor safety research. CSNI reports cover the full scope of reactor safety concerns and are prepared by leading technical experts from the primary technical research laboratories and agencies of the member countries.

Current CSNI efforts contribute to U.S. programs in extended burnup reactor fuels, high-pressure melt ejection, direct containment heating, accident management, and steam explosions. Clearly, the CSNI has demonstrated the ability to keep pace with real concerns in nuclear safety. Furthermore, these efforts have resulted in substantial savings in U.S. research costs.

Nuclear safety is truly an international concern. The NEA is a forum for the consideration of common technical safety issues by the responsible regulatory agencies in the member countries and has been useful in developing consistent "western" positions. If the NEA did not exist, we would soon be convinced that it should be invented.

We believe that the suggested U.S. withdrawal from the NEA is shortsighted. We fully support your efforts to ensure continued U.S. participation in the NEA.

Sincerely,

/S/

T. S. Kress
Chairman, ACRS