



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

July 17, 1985

Honorable Nunzio J. Palladino
Chairman
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Palladino:

SUBJECT: ACRS COMMENTS ON PROPOSED NRC SAFETY GOAL EVALUATION REPORT

During its 303rd meeting, July 11-13, 1985 and its 302nd meeting, June 6-8, 1985, the Advisory Committee on Reactor Safeguards met with representatives of the NRC Staff and reviewed the NRC Safety Goal Evaluation Steering Group report dated April 1985 (Reference 1). During our review, we had the benefit of three meetings of the ACRS Subcommittee on Safety Philosophy, Technology, and Criteria held on December 12, 1984, May 8, 1985, and July 10, 1985. We also had the benefit of the documents referenced.

The Executive Director for Operations has not completed his formulation of recommendations to the Commission. However, recommendations have been provided by the Steering Group, by Mr. Harold Denton, Director, Office of Nuclear Reactor Regulation, by Mr. Robert Minogue, Director, Office of Nuclear Regulatory Research, and by other senior NRC Staff members. Some of these recommendations suggest significant changes in the proposed 1983 Safety Goal Policy Statement.

Our comments at this time are based primarily on our review of the Steering Group report. We expect to make further comments after the Executive Director for Operations has formulated his recommendations to the Commission.

We conclude that the NRC is not ready to reaffirm and implement the 1983 Safety Goal Policy Statement in its original or even some slightly modified form. Much progress has been made and the effort should continue. However, the form of the design objectives and the plan for implementation are not yet well enough developed. We believe that greater attention should be placed on working toward an objective of a mean-core-melt frequency of 10^{-4} per reactor year and use of a containment performance objective. We are concerned that the Safety Goal Policy Statement may not give sufficient emphasis to defense-in-depth and may place too much emphasis on benefit-cost analyses.

Areas of Agreement

We agree with many of the findings and conclusions of the NRC Staff Safety Goal Steering Group, including the following:

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- . PRA methods and resulting insights have proven to be very valuable in establishing priorities for regulatory activities, the development of regulatory positions on generic safety issues, and the assessment of plant-specific safety issues.
- . PRA has limitations that must be understood when the results are used. The results of a PRA should normally be used in conjunction with traditional safety review methods in making regulatory decisions.
- . The statement of the Qualitative Safety Goals in the 1983 Safety Goal Policy Statement is satisfactory.
- . For sites where no people reside within a mile of the site boundary, for purposes of calculation of early fatalities, an individual should ordinarily be assumed to reside one mile from the site boundary.
- . In applying the latent cancer fatality numerical guideline, we agree with the Steering Group that it is better to consider the population within 10 miles of the site, rather than 50 miles as proposed in the 1983 Policy Statement. This goal is not a societal risk goal but an individual risk goal because it is not related to the number of persons affected. Consideration should be given to the use of a one-mile distance, as suggested by Mr. Denton.
- . We support the general principle that no more than about 10 percent of any quantitative design objective should be accounted for by a single major issue or accident.

Implementation Procedures, Particularly Core Melt Objective

The Steering Group has proposed a number of detailed implementation procedures. The Committee has a range of questions on the proposed operating limits, and wishes to discuss these matters in detail with the NRC Staff. The implementation procedures should not be adopted in their current form.

In its letter to you dated September 15, 1982 (Reference 2), the ACRS stated that mean, not median, values should be used and that an operational level for core melt of 10^{-3} per reactor-year is too large for all but a few, small, existing nuclear plants. Even a mean value of core melt of 10^{-3} per reactor-year is too large. As part of defense-in-depth, action to reduce such a core-melt-frequency should be part of the Commission's policy, not subject to the current benefit-cost backfit requirements as specified in the proposed Backfit Rule and implementing Manual Chapter.

We believe that the Commission should state that a mean-core-melt frequency of not more than 10^{-4} per reactor year is an NRC objective for all but a few, small, existing nuclear plants, and that, keeping in mind

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the considerable uncertainties, prudence and judgment will tend to take priority over benefit-cost analysis in working toward this goal.

Containment Performance Objective

The NRC Staff has not developed a containment performance guideline, nor has any serious NRC Staff effort to do so been apparent to the Committee. The ACRS continues to believe, as it did in its report of June 9, 1982 (Reference 3) that the development of a containment performance guideline warrants high priority, and recommends that the Commission require early NRC Staff attention to this matter as part of maintaining its defense-in-depth principle. Approximate compliance to an appropriate criterion should be an NRC objective.

Use of Median Values

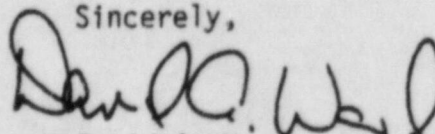
The Steering Group proposes to use median values for assessing compliance with the quantitative guidelines "so as to provide stability to estimates even if the uncertainties are much larger in one case than another." We disagree with the use of median values for purposes of input into decision making. If it is available, we believe that knowledge of the uncertainty range and the frequency distribution of consequences (whether they be core melt or individual risk) is important to have for decision making. However, we believe that when a single value is used for comparison against a numerical guideline, it should be the mean, not the median value of the parameter involved. The mean should be evaluated in as appropriate a manner as the available information permits.

While addition of the mean values for each of a set of sequences does provide the mean value of the combined sequences, the addition of the medians does not provide the median value for the combined set nor, for that matter, does it provide any clearly defined property of the combination.

If the pattern and extent of uncertainties are so ill-defined as to make any assignment of mean-core-melt frequency or risk not meaningful, the median likewise will lack sufficient meaning to have an important input into decision making.

Additional comments by ACRS Members Harold W. Lewis, Forrest J. Remick, Max W. Carbon, and Glenn A. Reed are presented below.

Sincerely,



David A. Ward
Chairman

Additional Comments by ACRS Member Harold W. Lewis

I disagree very strongly with the overall thrust of the Committee's letter on the Safety Goal Policy Statement, even though I agree completely with the recommendation that the Commission not affirm the 1983 Statement. My reasons are so different from those of the Committee that they point toward different directions for future development, and therefore warrant separate expression. Some reasons have been expressed before [see additional comments to ACRS letter dated June 9, 1982 incorporated herein by reference (Reference 3)].

To avoid wallowing in the details and thereby losing the point, it may be useful to first say what I think the Commission should do. The rest will fall into context.

I believe the Commission should issue a declarative and arbitrary quantitative safety goal statement at this time, stating it as an objective, acknowledging its arbitrariness, inviting discussion of the exact numbers, and acknowledging that tradeoffs between containment and prevention will sometimes be necessary to meet the objectives. It should nonetheless -- this is not contradictory -- commit itself to maintaining the principle of defense-in-depth. The risk used should be societal -- that is NRC's responsibility. It should recognize uncertainty, and accept the responsibility for decision making in the face of uncertainty -- there are no pat formulas.

The Commission should further commit itself to cost-benefit analysis -- not to assure an adequate level of safety, but to assess the value of improvements to safety. Cost-benefit analysis is not now done very well by the NRC Staff, but the proper response to that is to improve craftsmanship, not reject the tool. (This is also important for the back-fitting issue.) There will indeed be great uncertainties in both cost-benefit analyses and in the assessment of where a particular reactor stands with respect to the quantitative goals. These uncertainties are not created by the analysis -- they are revealed by it. The Commission should acknowledge this.

With that preamble, detailed comments on the Committee letter follow:

The Committee is concerned that "too much emphasis [may be placed] on benefit-cost analyses." That will surely be read by some to mean that the Committee rejects cost-benefit analysis as a tool in the management of nuclear safety. If it does mean that, it is a grievous error. If it does not, it is inappropriate wording. It is particularly disturbing in view of the Commission's efforts to rationalize the regulatory process.

The Committee agrees with the statement of the Qualitative Goals in the 1983 Commission Statement. For my disagreement, see the reference cited above.

The Committee has a series of detailed comments about averaging radii, which serve to further obfuscate the societal/individual risk issue. It further states, incorrectly in my view, that the latent cancer fatality goal is an individual goal. It is, in fact, an obscure mixture of the two -- neither fish nor fowl. I support societal goals, and would rather deal with individuals as individuals. I even believe that is NRC's charter.

The Committee takes no position on the on-site/off-site question. I believe that on-site costs of an accident are not the responsibility of NRC, which is charged with the protection of the health and safety of the public. The exception is that of on-site radiation exposure of people, which is its responsibility.

The Committee comments about median versus mean are, if anything, understated. It is a disgrace that NRC Staff should continue to recommend criteria based on medians of core-melt probabilities. This is not a matter of taste -- it is simply wrong to add median probabilities. I find it extremely disturbing that, despite the number of times this has been brought up, your Staff continues to fall short of even elementary textbook-level awareness of this. If this is harsh, so be it.

The Committee states that a core-melt probability of 10^{-3} per reactor-year is too large, independent of containment considerations. I do not believe the core-melt probability should be so arbitrarily separated from the other issues. It may be convenient for regulatory purposes, but it is not appropriate public policy.

I would also have made some comments about the importance of pressing the Staff to make realistic calculations for safety goal compliance. The regulatory habit of erring on the conservative side is inappropriate here, and people seem to have trouble shedding their regulatory customs.

In summary, I recommend that the Commission continue the tedious process of learning how to deal with quantitative risk analysis, and with decision making in the face of uncertainty. The time is not yet ripe for the promulgation of quantitative safety goals other than on an arbitrary basis, as recommended above. Progress is being made on the "how safe is safe enough" question. Let it continue.

Additional Comments by ACRS Member Forrest J. Remick

I disagree very strongly with much of the Committee's letter on the Safety Goal Policy Statement. I see a number of the Committee's comments as restatements of prior views which indirectly attack the Commission's promulgation of a safety goal policy statement, in contrast to a thorough evaluation of the Safety Goal Evaluation Report prepared by the Safety Goal Evaluation Steering Group at the end of a two-year evaluation period.

I think that, based on the two-year evaluation and the generally excellent Steering Group report, the Commission is ready to utilize its Safety Goal Policy Statement to augment its traditional safety review methods in making regulatory decisions. Like the Steering Group, I think such use will help add objectivity and predictability to the regulatory process and can be used as a regulatory yardstick against which a wide range of regulatory issues can be measured.

I do take exception to the Steering Group's proposed change to the benefit-cost guideline from that defined in NUREG-0880, Revision 1. The basis for my exception is as follows:

The Commission's responsibility under the Atomic Energy Act is to promote common defense and security and to protect the health and safety of the public. The extent to which the health and safety of the public is to be protected is neither specified in the Act nor in the Commission's regulations.

The Commission's Policy Statement on Safety Goals for the Operation of Nuclear Power Plants expresses the Commission's view on the acceptable level of risk to public health and safety and on the safety-cost trade-offs in regulatory decision making. Therefore, the Commission has defined for the first time how safe is safe enough with respect to protecting the health and safety of the public from the risks of the operation of nuclear power plants.

The Atomic Energy Act does not indicate that the Commission has the responsibility to protect licensees from the risk of potential economic loss of investment resulting from the operation of their nuclear power plants. Therefore, the Commission's Policy Statement on Safety Goals does not define acceptable levels of risk of such losses.

The Commission adopted a benefit-cost guideline in its Policy Statement to encourage the efficient allocation of resources in safety-cost tradeoff decisions related to Commission-imposed plant modifications. Consistent with the Atomic Energy Act, the benefit in the benefit-cost guideline is defined as a reduction in public risk (in terms of a reduction in the collective population exposure measured in person-rems). Averted economic risks to the licensee which hypothetically might result from a Commission-imposed modification, rightfully are not defined as a benefit in the benefit-cost guideline. Therefore, a Commission-imposed modification could not be justified on the basis that it might reduce economic risk to the licensee.

Earlier the Commission solicited and received public comments on this point. Most commenters were opposed to the proposed change in the benefit-cost guideline. The following partial quote from the comment by Duke Power Company summarizes the views of the twenty-four commenters opposed: "The benefit side of the benefit-cost analysis should represent a measure of the potential reduction in risk only in terms of public health and safety. The NRC is not charged with, and should not

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concern itself with, protecting the financial investment of a utility and its shareholders in a nuclear plant" (p. 74, NUREG-0880, Rev. 1).

Some proponents of including hypothetically averted economic costs to licensees as a benefit in the benefit-cost guideline are concerned that unless this is permitted, certain proposed plant modifications or backfits might not prove cost beneficial. That is, the cost of the modification would preclude its imposition because the modification would not substantially reduce risk to the health and safety of the public.

The continued efforts to impose modifications regardless of their cost compared to their public health and safety benefit have contributed greatly to the loss of control of the regulatory process. Further, they have contributed to making nuclear plants more complex and perhaps less safe than would be the case otherwise.

For these reasons, I strongly disagree with the proposed change in the benefit-cost guideline. Hypothetically averted economic risks to licensees are not justifiable benefits from the standpoint of protecting public health and safety. Therefore, they should not be included as a benefit under the benefit-cost guideline of the Commission's Policy Statement on Safety Goals for the Operation of Nuclear Power Plants.

Additional Comments by ACRS Member Max W. Carbon

I share Forrest Remick's disagreement with the Steering Group's proposed change to the benefit-cost guideline from that defined in NUREG-0880, Revision 1.

Additional Comments by ACRS Member Glenn A. Reed

I agree with most of the ACRS letter and particularly I agree with a safety goal for core-melt frequency of 10^{-4} . Also, I agree with the additional comments of Forrest Remick. It is my considered opinion that the adoption of the core-melt frequency approach, rather than any use of averted on-site benefit-cost analysis, is more likely to lead to safety improvements since averted costs will involve many more uncertainties, delay and confusion.

References:

1. NRC Safety Goal Evaluation Steering Group report dated April 1985, "Safety Goal Evaluation Report," transmitted by memorandum from Thomas E. Murley, Chairman, Safety Goal Steering Group, to Raymond F. Fraley, Executive Director, ACRS, dated April 18, 1985
2. Letter from P. Shewmon, ACRS Chairman, to Nunzio J. Palladino, NRC Chairman, Subject: ACRS Report on the Draft Action Plan for Implementing the Commission's Safety Goals for Nuclear Power Plants, dated September 15, 1982

3. Letter from P. Shewmon, ACRS Chairman, to Nunzio J. Palladino, NRC Chairman, Subject: Comments on Proposed Policy Statement on Safety Goals for Nuclear Power Plants (NUREG-0880, A Discussion Paper), dated June 9, 1982
4. U. S. Nuclear Regulatory Commission, "Safety Goals for Nuclear Power Plant Operation," USNRC Report NUREG-0880, Revision 1, dated May 1983
5. Memorandum from Malcom L. Ernst, Deputy Director, Office of Nuclear Regulatory Research, to Thomas E. Murley, Regional Administrator, Region I, Subject: Emphasis on Defense-in-Depth and Accident Prevention in Safety Goals, dated May 10, 1985
6. Memorandum from Robert B. Minogue, Director, Office of Nuclear Regulatory Research, to William J. Dircks, Executive Director for Operations, Subject: Safety Goal Evaluation Report, dated May 21, 1985
7. Memorandum from Harold Denton, Director, Office of Nuclear Reactor Regulation, to William J. Dircks, Executive Director for Operations, Subject: Safety Goal Evaluation Report, dated June 12, 1985

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