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

September 15, 1982

DESIGNATED ORIGINAL
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Honorable Nunzio J. Palladino
Chairman
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Dr. Palladino:

SUBJECT: ACRS COMMENTS ON THE NRC STAFF QUESTIONS TO THE COMMISSION
CONCERNING THE POLICY STATEMENT ON SAFETY GOALS FOR NUCLEAR
POWER PLANTS

Dear Dr. Palladino:

As a further contribution to the ongoing actions by the Commission on the formulation of a statement on safety policy and safety goals, the ACRS has developed the following comments on the fifteen questions posed to the Commission by the NRC Staff in a memorandum from F. J. Remick to the Commissioners dated July 20, 1982. We have also noted several other issues which the Commission should address in its continuing consideration of safety policy matters.

Dr. Forrest J. Remick did not participate in Committee deliberations regarding this matter.

Sincerely,
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P. Shewmon
Chairman

Attachment:
as stated

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ACRS COMMENTS ON THE NRC STAFF QUESTIONS TO THE COMMISSION CONCERNING THE POLICY STATEMENT ON SAFETY GOALS FOR NUCLEAR POWER PLANTS

Question 1

Does the Commission agree that the policy statement on safety goals is not intended, in itself, to require probabilistic risk assessments in any particular application or to impose other licensing requirements? Such additional requirements would be authorized only by the Commission's regulations or by other specific Commission action.

ACRS Comments

We believe that the policy statement on safety goals should not, in itself, require the performance of probabilistic risk assessments (PRAs) in any particular licensing proceeding or impose other licensing requirements. We believe there should be a trial period of at least two years in which the Safety Goals are systematically tested in a nonbinding fashion in each of the ways in which they might later be applied.

As we stated in our letter of June 9, 1982, the Committee believes an explicit distinction should be made between safety goals addressed to the public and design requirements intended to implement those safety goals which are addressed to the regulated industry. We believe that individual licensees should usually not be required at this time to undertake PRAs intended to yield health risk values for direct comparison with the safety goal. However, we do favor development of a plan in which appropriately defined PRAs would be performed for essentially all plants in approximately the next five or six years. These analyses should usually go to the point of estimating the frequency of different radioactive release categories from containment.

The scheduling should be worked out cooperatively between the industry and the NRC, with priority given to older plants and plants having a relatively high surrounding population density. The PRAs should include all initiators and contributors (except for sabotage) as the methods permit in a practical sense at the time of the particular PRA. The PRAs should be performed with active participation by as many licensee personnel as is practical. Such PRAs with increased involvement by licensees would serve several principal functions we believe are pertinent to the safety goal program:

- (a) Serve as an important tool whereby the licensee will better understand his plant and be better able to take advantage of operating experience at his plant and elsewhere.
- (b) Provide a systematic way for examining the appropriateness of operating procedures, maintenance and test procedures, technical specifications, and emergency procedures.
- (c) Identify weak links in a specific plant which may contribute in a significant way to risk.

- (d) Provide a pool of information on generic and specific plant risks which can be used by the NRC Staff to help determine whether existing regulations are adequate to assure compliance with the safety goal, to identify regulations which may adversely impact safety, and to modify existing regulations or to develop new ones, if necessary.

Thus, these PRAs would not generally be required for use in licensing determinations. They would be done for the purpose of risk management. Bottom line risk numbers would not be needed except in very specific situations.

We note that the Staff has included operational guidelines in its Draft Action Plan. If these are eventually to be used they need further evaluation. In particular, the proposed limit of a median, best-estimate core melt frequency of 10^{-3} /reactor-year with incomplete accounting of initiators and contributors is unacceptable.

We believe that trial review processes should be established for both industry-sponsored PRAs and PRAs (or reliability analyses) performed by or for the NRC Staff. We believe it is important that a process of review and evaluation (and eventual decision making) be established that is perceived to be fair and that is likely to provide plausibility and reasonable stability in its results.

We believe that during the trial period the safety goals could be helpful in NRC Staff efforts to evaluate the safety benefits and costs of proposed new or revised regulatory requirements. They could also be helpful in evaluating issues related to specific operating plants.

However, during the trial period, the NRC will have to continue to make decisions concerning the potential need for backfitting or even shutting down plants to remedy a safety problem.

We recommend that the matter of threshold criteria for action (or operational limits) receive priority in the reformulation of a Draft Action Plan. The ACRS is willing to work with the Staff on this issue. Alternate sets of trial criteria should be developed and the implication of each set examined during the trial period.

Question 2

The draft policy statement (NUREG-0880) focused on reactor accidents. Should the scope of the policy statement be expanded to include routine emissions:

- (a) even if it means that the 0.1 percent ratio would need to be increased for cancer risks, or

- (b) only if routine emissions can be included without increasing the 0.1 percent ratio?

ACRS Comments

We believe that routine emissions ought to be included or otherwise acknowledged in the effects ultimately considered in the safety goal policy. From some estimates provided by a member of the NRC Staff, the routine doses received by the maximum exposed individuals in the vicinities of several operating plants are a small fraction of the radiation exposure limits implied in connection with the safety goals as presently proposed in NUREG-0880. However, there is a considerable range in the estimates available. It would seem worthwhile to have the data formally presented which would show the full range of potential exposures to individuals within one mile of the site boundaries of presently operating plants as a result of routine operations.

Question 3

Should a hypothetical individual, located at one mile from the site boundary, be postulated for those plants where no one lives within the vicinity of the site?

ACRS Comments

We suggest that alternate approaches be formulated and their ramifications be examined in detail during the trial period. It seems logical that a site having no resident within one mile should somehow have this fact acknowledged. However, if the licensee does not have positive control of the uninhabited zone, practical means would have to be worked out in advance for dealing with a change wherein people moved within a mile of the facility.

Question 4

Should the second qualitative safety goal on societal risk include comparisons to viable competing technologies as stated in NUREG-0880?

ACRS Comments

We find the statement of the second qualitative goal in NUREG-0880 to be reasonable and believe it reflects society's wishes. However, if the Commission believes that studies of the matter should be made before deciding to include a comparison with competing technologies, we believe that such studies would be a possible alternative for the trial period.

Question 5

Should the quantitative interpretation of the second qualitative safety goal on societal risk be:

- (a) a separate societal design objective as proposed in NUREG-0880,
- (b) a separate societal design objective designed to be of greater utility (than the one proposed in NUREG-0880) in limiting societal risk, or
- (c) the benefit-cost guideline (as a surrogate)?

ACRS Comments

We believe that there should be a separate societal design objective. However, the statement in NUREG-0880 would permit the societal effects to increase in proportion to the surrounding population density within fifty miles. Rather, it should be related to a measure of the benefits of the facility, which depend to first order on the electrical megawatt-hours generated.

In its comments on NUREG-0880 dated June 9, 1982, the ACRS suggested an alternate form for this objective.

Question 6

For the plant performance design objective, should the wording:

- (a) "large scale core melt" be retained as proposed in NUREG-0880, or
- (b) "loss of protective features leading to severe core damage" be used with the understanding that the "loss of protective features" wording may need to be refined?

ACRS Comments

We favor use of the term "large scale core melt."

Question 7

Should the aversion of economic losses (on and off-site) be considered as a benefit in the application of the benefit-cost guideline?

ACRS Comments

We believe it is important to include the avoidance of economic losses (on and offsite) as a benefit in the application of the benefit/cost criterion, together with an appropriate benefit for the avoidance of health

effects. Society would have to bear directly any offsite costs. In addition, onsite costs are likely to be passed along to society in whole or in part, through insurance or other costs which would be reflected in electricity rates.

If the incremental cost of replacement power during down time to implement a modification is a cost, the avoidance of down time which would be caused by an accident is a benefit.

The estimation of man-rem involves a trade-off between cleanup costs (in dollars and man-rem), the area to be interdicted, and the dose commitment to society. One could abuse such an estimation by assuming large areas of interdiction and/or lower than practical residual doses after cleanup if only man-rem avoided were included in the benefit/cost criterion without consideration of economic costs.

As a minimum we recommend that, during the trial period, benefits and costs be analyzed using two methods of estimating benefits: one as proposed in NUREG-0880, the other encompassing onsite and offsite economic and health costs avoided.

As part of this exercise, consideration should also be given to revising the objectives of the safety goals to make them compatible with the proposed more extensive approach to assessing benefits.

Question 8

Should a design objective for containment availability be specified?

ACRS Comments

We recommend that a few alternate approaches to possible containment performance criteria be formulated soon and evaluated during the trial period. These criteria should probably be different for OLS and for plants yet to receive construction permits.

The Committee believes that this effort should be undertaken with the intent of establishing containment performance criteria. We believe that, in view of the continuing uncertainties to be expected in the art of PRA and a continuing inability to satisfactorily treat all initiators and other contributors to core melt frequency, and in view of the potentially very large differences in release magnitudes among different core melt accidents, containment performance design objectives are needed and should be developed expeditiously.

We note that at least two countries employing LWRs have developed containment performance criteria/design features to improve their capability to mitigate core melt accidents.

Question 9

Should the design objectives include a provision for risk aversion?

ACRS Comments

In its report dated June 9, 1982 on NUREG-0880, the ACRS recommended a statement of policy concerning risk aversion. We do not favor the establishment of a numerical approach to risk aversion at this time. However, the currently proposed safety goals do not treat at all society's concern with the potential for long-term contamination of significant land areas following an unlikely accident involving significant release of radionuclides other than iodines and noble gases. We believe that alternate possible approaches to this question should be formulated and evaluated during the trial period.

Questions 10-15

10. Is the use of a two-level approach (i.e., design objectives and operational levels) acceptable?
11. Does the Commission intend that the Staff use the safety goal as a means for assuring that all existing reactors, both ORs and OLs, meet some minimum level of public risk?
12. If so, what should be that level? The Design Objectives or the Operating Levels?
13. Does the Commission intend that the Staff use the safety goal primarily as a means for shaping future regulations and for ensuring that new plants and standard plant designs meet some minimum level of public risk?
14. If so, what should be that level? The Design Objectives or Operating Levels?
15. At what level should the Staff stop applying the ALARA guidelines for improving new plant designs?

ACRS Comments

The quantitative guideline on individual risk in NUREG-0880 appears to be adequate to meet the first qualitative safety goal. However, we believe that the use of a median, best-estimate calculation for comparison with the proposed guideline of 10^{-4} /reactor-year for core melt frequency may not be satisfactory.

If there were both a containment performance design guideline and a core melt frequency guideline, problems arising from large uncertainties and inadequacies in core melt prediction might be partially assuaged. However, the proposal to use a median, best-estimate core melt frequency of 10^{-4} /reactor-year as a principal test of overall societal protection is unsatisfactory.

The proposal of 10^{-3} /reactor-year as the operational level in the Draft Action Plan is even less satisfactory. If accepted, this would imply that a high likelihood of a core melt accident every ten years is the operational level. Furthermore, this would be independent of containment capability. It would depend strongly on subjective input parameters and would exclude some important initiators and contributors.

At a high confidence level, allowing for all accident scenarios, such an operational level might be more appropriate.

We believe that, as a minimum, risk estimates during the trial period should include both the median and the mean, plus an explicit attempt to quantify confidence limits, say 10% and 90%. In addition, deliberate, detailed attention should be given to the uncertainties (or differences of opinion) in the confidence limits. In any event, the question will be asked: "Whose best-estimates apply?" If uncertainties are not explicitly quantified and included, the whole process is likely to lose credibility.

We recommend that alternative approaches to objectives and operational levels (different in method/numerical input) be developed and tested (on a mock basis) during the trial period. This should also include the possibility of different levels of risk (or different design objectives) for existing and future reactors.

In addition to providing comments on the fifteen questions, we wish to note that there remain other issues which the Commission should address in its continuing consideration of safety policy matters. Some of these issues are listed below:

1. What information will be needed and used to measure NRC/nuclear industry success in reaching the goals?
2. What type of licensing actions, if any, will ultimately be governed by safety goal considerations?
3. How should decisions be made in the presence of large uncertainties in PRA results?
4. Are the same sets of information needs and quantitative design objectives relevant for the public and for the regulated industry?

5. What process of implementation of quantitative design objectives is likely to be perceived as fair by all parties and to yield results which remain plausible and relatively stable?
6. As formulated, does the safety policy provide a basis for the development of policy concerning severe core accident prevention and mitigation?
7. Should the NRC anticipate the need for alternate bases to PRA to establish the need for regulatory action, and if so, should they be developed and identified as part of the ultimate safety goal policy?
8. Should not the safety goal policy be closely integrated with backfitting and severe accident policies? If so, a correlated effort is needed.

As a subset of Item 1, above, one can ask, if PRAs are utilized to evaluate success in attainment of safety goals, what information will be needed concerning containment efficacy, interdiction, and decontamination costs and effectiveness, and the effectiveness of supplemental mitigation features. Similarly, if there is incomplete information for the benefit/cost analyses called for in the safety goal approach, what course of action will be followed in the regulatory process?

Consideration of the latter indicates that the NRC will need to have a capability for reliable estimation of the cost of safety improvements and backfitting actions, as well as good measures of the benefits. Such benefit/cost estimates will have to be fairly detailed and include, for example, time to implement a change, the cost of financing plant modifications, and the manner in which such costs enter into a licensee's electrical rate base. Since the burden of proof for benefit/cost analyses may be borne much of the time by the NRC Staff, they will need to have and be able to apply the appropriate resources.

References:

1. Memo, F. J. Remick, Director, Office of Policy Evaluation, to Commissioners, Subject: Questions on Safety Goals dated July 20, 1982
2. Memo, F. J. Remick, Director, Office of Policy Evaluation, to Commissioners, Subject: Safety Goals for the Operation of Nuclear Power Plants, dated July 12, 1982
3. U. S. Nuclear Regulatory Commission, NUREG-0880, Subject: Safety Goals for Nuclear Power Plants: A Discussion Paper, dated February 1982
4. Memo, W. J. Dircks, NRC Executive Director for Operations, to Commissioners, Subject: Action Plan for Implementing the Commission's Proposed Safety Goals, dated July 6, 1982
5. SECY-82-1A, Policy Issue (Affirmation) from W. J. Dircks, Executive Director for Operations, Subject: Proposed Commission Policy Statement on Severe Accidents and Related Views on Nuclear Reactor Regulation, dated July 16, 1982
6. Letter, C. Walske, Atomic Industrial Forum, to N. J. Palladino, Chairman, NRC, Subject: NRC Safety Goals and Plan for Implementation, dated September 10, 1982