

NUREG-0735

Plan for Developing a Safety Goal

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INTRODUCTION

This report presents a Commission-approved plan for development and articulation of NRC safety objectives, notably -- but not exclusively -- with respect to reactors; with special attention to interim objectives attainable in the near term, but including consideration of an overall program as well.

The plan is based on a proposed plan, submitted pursuant to Commission direction, by Edward J. Hanrahan, Director, Office of Policy Evaluation (OPE) and Leonard Bickwit, Jr., General Counsel. The principal authors of the plan were George Sege, Senior Policy Analyst, OPE, and Martin Malsch, Deputy General Counsel. In preparing the plan OPE and the Office of the General Counsel (OGC) had the benefit of consultation with the Offices of Nuclear Regulatory Research (RES), Nuclear Reactor Regulation (NRR), and Standards Development (SD), and ACRS members and staff. Commission comments are reflected.

BACKGROUND

1. Origin of the Plan

In connection with its consideration of SECY-80-230B, "Update of Chapter V of TMI Action Plan: NRC Policy, Organization, and Management," the Commission directed OPE and OGC to prepare a proposed plan for developing a safety goal, to be submitted to the Commission in August 1980. The plan was to include provisions for utilizing on-going efforts by the Office of Research NRR, and the ACRS, which are scheduled to be completed in October 1980. (Memo, Secretary to EDO/GC/OPE/OPA, 7-9-80, at item 9.) In response to that direction, OPE and OGC submitted a proposed plan for the Commission's consideration on August 12, 1980. (SECY-80-379)

The Commission further directed that OPE submit, by December 29, 1980, a draft safety policy statement for Commission consideration and public comment. (Memo, Secretary to EDO/GC/OPE/OPA, 7-9-80, at item 10.) Provision for that draft policy statement was included in the proposed plan.

The Commission had previously stated its intentions in this regard:

- In its FY 1982-86 Policy, Planning, and Program Guidance, the Commission stated its intent to seek to define more clearly the level of protection of the public health and safety that it believes is adequate.
- In its letter to Dr. Press commenting on the report of the President's Commission on the Accident at Three Mile Island, the Commission stated that it is prepared to move forward with an explicit policy statement on safety philosophy and on the role of safety-cost tradeoffs in NRC safety decisions.

On October 14, 1980 the Commission approved the proposed plan, subject to certain comments, which are now reflected in the plan.

2. Work Status (Current as of August 12, 1980.)

Pertinent work has been or is being done or sponsored by OGC, the ACRS, RES, and NRR. The status of these efforts is presented in Appendix A (supplemented with further detail concerning the RES-sponsored efforts in Appendix 2).

The NRC and others have underway a number of probabilistic plant analyses which are producing estimates of the probability of significant accident sequences (severe core damage or core melt sequences). The Probabilistic Analysis Staff (Office of Research) has been suggesting the use of interim criteria and priorities for taking corrective action pending formal development of numerical criteria.* The interim criteria suggested by PAS are as follows:

* (1) "Interim Quantitative Action Criteria," R. Bernero (PAS) to R. Mattson (NRR), 7/29/80. (2) "Crystal River IREP Study and Interim Criteria for Action," R. Bernero to R. Mattson, 7/22/80. (3) R. Bernero, oral presentation at Duke Power Co./NSAC Seminar on Oconee Risk Assessment, Charlotte, N.C., 7/22/80. (4) R. Bernero, oral presentation before ACRS Subcommittee on Reliability and Probabilistic Assessment, Los Angeles, CA., 7/1/80.

| <u>Estimated Probability of Severe Core Damage, Per Year</u> | <u>Action</u> |
|--|---------------------|
| Greater than 10^{-2} | Correct in days |
| 10^{-2} to 10^{-3} | Correct in months |
| 10^{-3} to 10^{-4} | Correct in years |
| 10^{-4} to 10^{-5} | Consider correction |
| Less than 10^{-5} | No action |

Users of these interim criteria are urged to weigh possible bias in the analysis, the quality of the analysis, the potential scale of consequences, and other significant factors in applying them.

3. Legislation

The Senate's NRC Authorization bill for FY 1981, S. 2358, would require NRC, after notice and opportunity for public hearing, to develop a safety goal for reactor regulation. The goal would be required to delineate subjective criteria, supplemented to the extent possible by quantitative criteria. The bill calls for consideration of retroactive -- as well as prospective -- application of the goal. It specifies a June 30, 1981, deadline for a report to Congress. (Section 5 of S. 2358.) There is no corresponding provision in H.R. 7981, the House compromise version of the NRC FY 1981 authorization, which has not yet been considered by the full House.

DISCUSSION

1. The Safety-Goal Issue and its Parts

The basic principle of a safety goal and its application is simple: a general degree of safety is established as a goal and rules are made and licensing actions taken with that goal in mind. Ideally the goal would be translated into actual decision standards by Commission rules, and the rules (rather than the goal itself) would be applied in individual cases. In practice, development of a safety goal is subject to complications which

are of the essence of the issue. They stem from data-base gaps, which limit knowledge of what the risks are; different philosophical perspectives as to criteria that should be used to define when a risk is "acceptable"; and important subsidiary issues, such as those involving economic and equity considerations, and techniques of interpretation under uncertainty.

The questions constituting these essential parts of the issue can be articulated and grouped in many ways. In fact, such articulation and grouping are expected to evolve as the policy development work progresses. The following is a starter list, compiled for initial planning purposes and as a point of departure for later modifications:

- a. What estimated risks flow from available licensing-policy options?
 - (1) What uncertainties surround those estimates?

- b. What known risk levels are acceptable?
 - (1) What uncertainties are acceptable?
 - (2) To what extent is there increased aversion to risk of high consequences even at low probability?

- c. What constrains safety requirements that NRC should impose?
 - (1) What is the role of safety-cost tradeoffs?
 - (2) To what extent should benefits of nuclear power -- absolute and relative to alternatives -- enter safety-requirement decisions?
 - (3) To what extent is it appropriate for requirements for new and previously approved plants to differ?
 - (4) How should stringency of safety goals compare with risks accepted from other (non-nuclear) electrical energy sources and with risks arising in various other contexts?

- (5) To what extent should equities of distribution of benefits and adverse impacts influence safety requirements?
 - (6) Should safety goals be applied directly to cases, in order to attain a similar degree of safety from case to case (even though that may result in specific design and operation requirements differing according to circumstances)? Or should goals be applied generically and have requirements, rather than estimated degree-of-safety results, be uniform?
 - (7) To what extent should goals reflect protection of individuals regardless of numbers of persons affected, and to what extent should they reflect total, integrated population or societal effects?
- d. What policies are appropriate in the face of gaps in knowledge as to what the risks are and the need for clarity of licensing requirements?
- (1) Should there be an overall top-level safety-goal policy that would control lower-order specific decision classes, with toleration of uncertainties in interpretation of overall policy in terms of specific regulations? Or should goals be defined in operationally useful form for narrower areas, thereby achieving better predictability of requirements, though at the cost of losing some overall philosophical consistency and conceptual completeness?
 - (2) What is the proper balance between stability of requirements and flexibility for modification as knowledge develops and insights change?
- e. In view of inherent uncertainties, how should probability estimates and consequence predictions be verified?
- f. Under uncertainty as to goals or imprecision of goals or doubts as to their interpretation, how should judgments be made in:

(1) Establishing generic requirements?

(2) Cases?

2. Program Approach

The program approach focuses in the near term on (a) general policy statements, (b) articulation of policy with respect to parts of the issue, and (c) isolation of more difficult questions for further consideration. The approach rests on recognition that even if a full and definitive resolution of the safety-goal issue is not a practical near-term objective, highly useful purposes can be served by significant limited contributions to the objectives. In addition, the policy development process itself can perform a useful function of illuminating the safety-goal issue and its place in regulation, thereby helping to rationalize regulatory decision-making.

The program emphasizes development of options for near-term Commission action, while also providing for foundation-laying for subsequent further development of policy.

The method of approach includes the following elements:

- Utilization of results and interim results of ongoing NRC efforts (ACRS, RES, NRR).
- Consideration (and, as appropriate, solicitation) of inputs from outside groups with considered views (AIF, EPRI, other industry groups; nuclear-critic groups).
- Performance of background studies (past AEC/NRC practices, practices of other agencies, approaches in other industrial countries, theories and facts of risk acceptance).
- Workshops, for discussion among knowledgeable persons of varied viewpoints.

- Solicitation and consideration of public comments, with wide and varied opportunities for public participation (including public availability of papers for comment, public meetings, and public attendance at workshops, etc.).
- Reception and development of a broad range of alternatives before narrowing to a limited number of significant options (and ultimately perhaps a single recommended approach).
- Staff papers for Commission consideration at critical stages of policy analysis.
- Opportunities for Commission guidance as the work progresses. Preliminary Commissioner views will be sought in interviews early in the program.

The form of eventual Commission action (policy statement, rulemaking, etc.) is left open at this time.

Should there be legislative direction concerning this work, its scope and schedule will be reviewed in light of legislative requirements. The thrust of the Senate's bill (Section 5 of S. 2358) was taken into account in planning, but we judged it to be premature to rely on the scope and schedule specifics of that bill in structuring the program.

3. Organization and Management

The capabilities of the ACRS and all pertinent NRC offices will be utilized, supplemented by consultants and contractors as necessary. The plan gives program responsibility to OPE, working with an Inter-Office Steering Group, chaired by the Director, OPE.

PROGRAM PLAN

1. Objective

To develop an explicit articulation of policy with respect to the fundamental issues of public health and safety and the level of protection the Commission believes is adequate.

2. Scope

The policy articulation to be developed will include some general approach to risk acceptability and safety-cost tradeoffs, and, to the extent that these reasonably lend themselves to articulation, quantitative safety goals, safety improvement goals, and standards for review of past actions in light of new rules and improved practices.

The work will deal primarily -- but not exclusively -- with power reactors.

3. Overall Plan and Schedule

The proposed plan is keyed to submittal of two papers for Commission consideration and public comment, as follows:

- A preliminary policy paper by December 29, 1980.
- A policy paper within a year of submittal of the plan, which will include alternatives to meet the stated objective.

The milestones are presented in Table 1.

4. Tasks

The proposed work consists of the tasks described below.

Task I: LIAISON

1. Follow ongoing NRC and NRC-sponsored activities (including ACRS, RES, and NRR). Obtain final and interim results for consideration in the program. Principal early inputs include ACRS findings on quantitative

Table 1
PROGRAM MILESTONES

| <u>Event</u> | <u>Date</u> |
|--|-------------|
| Establish Inter-Office Steering Group | 10/24/80 |
| Preliminary reports on Brookhaven risk studies | 9/80 |
| Complete Commissioner interviews | 10/80 |
| Final report of ORNL study of approaches to acceptable risk | 10/80 |
| ACRS report on quantitative safety-goals | 10/80 |
| Amplified NRR paper on concepts and issues | 10/80 |
| Exploratory meetings on Approaches with NRC/Industry/Public Interest Groups | 10 & 11/80 |
| Complete working paper on Criteria | 11/17/80 |
| Submit information paper on detailed plans and schedule for Background Studies | 12/1/80(a) |
| Complete working paper on Alternative Frameworks | 12/1/80 |
| Submit PRELIMINARY POLICY PAPER | 12/29/80(b) |
| Hold Workshop on Frameworks | 2/17/81 |
| Receive public comment on Preliminary Policy Paper | 3/16/81 |
| Hold public meeting(s) | Spring '81 |
| Complete Background Studies | 4/30/81 |
| Complete preliminary draft of Proposed Approach | 5/20/81 |
| Hold Workshop on Proposed Approach | 6/23/81 |
| Submit POLICY PAPER | 8/12/81(b) |

(a) Some background studies may be initiated before that date.

(b) Issue for public comment after Commission approval for release.

safety goals (October 1980); final report on "Approaches to Acceptable Risk" (RES/ORNL/Decision Research, October 1980); preliminary reports on risk criteria and their impact and on risks of other societal activities (RES/ Brookhaven, September 1980); and a revised, expanded draft of paper on "Concepts, Problems, and Issues in Developing Safety Goals and Objectives for Commercial Nuclear Power" (NRR Division of Safety Technology, October 1980).

2. Establish and maintain contact with outside groups known or believed to have interest and considered views (including industry and public interest groups). Solicit as necessary and receive for consideration articulated views and analyses from these groups.
3. Establish and maintain information interchange with groups having relevant responsibilities and related interests. (This includes Congressional and NSF/NAS contacts, other governmental contacts, and may include foreign contacts.) (OPE, Inter-Office Steering Group, and to be assigned.)

Task II: BACKGROUND STUDIES

A. Nuclear Regulatory Statutes and Practices

Update and amplify the Commission paper, "Adequate Protection of the Health and Safety of the Public" (OGC, 10-18-79) as necessary to provide a current compendium including legal analysis, interpretation of safety goals in AEC/NRC regulations and cases, history of changes in law and interpretations, and controversies concerning interpretation. Prepare reports on legal and historic aspects. (OGC/Historian, early 1981.)

B. Statutes and Practices of Other Agencies

1. Select for study 3 to 10 other Federal agencies with important safety responsibilities. (Candidates include EPA; FAA; Department of Transportation, notably with respect to highway safety; NASA; Food and Drug Administration; Consumer Products Safety Commission).

2. Analyze the practices of the selected agencies with respect to safety goals, utilizing analysis of pertinent statutes in the October 1979 OGC paper.
3. Prepare report on findings, including comments concerning relevancy to NRC. (Responsibility and schedule to be determined.)

C. Approaches of Other Industrialized Countries to Safety Goals

Using information developed by the ACRS and RES, conduct limited additional study to round out the information concerning nuclear safety goals as viewed in other countries. (Candidate countries include UK, FRG, France, Japan.) Prepare report, including comments on relevancy to U.S. and NRC. (IP/OPE, schedule to be determined.)

D. Social Acceptance of Risks

1. Review the literature on the levels and circumstances of risk acceptance in contexts other than the nuclear industry, including the results of the RES-sponsored study of coal vs. nuclear risks and of recent CONAES studies of risks of various electrical energy sources. (Candidate other contexts include transportation, tobacco, alcohol, home and consumer products, industry, construction, dams, war, sports, natural hazards.)
2. Prepare summary reports (overview). (Responsibility and schedule to be determined.)

E. Theories of Risk Acceptance

Describe alternative theories of risk aversion and acceptance, including considerations such as relation to other risks, voluntary or involuntary exposure, nature of hazards, specificity of victim, number of persons at risk, proximity in time and place, relation to benefits, and uncertainty as to nature and magnitude of the risk, using the results of ORNL study and adding the limited work necessary. (OPE/RES, schedule to be determined.)

Task III: POLICY DEVELOPMENT

A. Criteria

1. Develop a set of criteria by which the merits of a safety-goal formulation should be judged. (Candidate criteria may include such considerations as: To what extent does the formulation address significant elements of the issue? How complete is it? To what extent does it lead to coherent and rational results? To what extent is it acceptable to affected publics? How clearly can it be interpreted in terms of regulatory actions? How useful is it? Etc.)
2. Prepare working paper for use in policy development. (OPE, November 1980.)

B. Frameworks

1. Develop candidate approaches to safety-goal formulation. (These may include frameworks that aim at a comprehensive statement, or statements with respect to only those parts of the issue judged to be tractable; quantitative and/or qualitative formulation approaches; concentrating on individual or social risks, or both; stated in terms of probabilities of events, such as core melt and/or containment failure, or of public consequences, notably radiation exposure risk; etc.) Drawn from work of ACRS, NRR, RES, AIF, EPRI, public interest groups, etc.
2. Prepare working paper on alternative frameworks, presenting a range of alternatives, for use in early policy development. (OPE, December 1, 1980.)
3. Narrow down to a few significant and usable approach options which span the range of approaches, and develop further for use in Subtasks III.C and D. (OPE, December 1980; update July 1981.)

C. Preliminary Policy Paper

1. Prepare a draft policy statement concerning safety goals, setting forth significant approach options, together with underlying rationale, for Commission consideration.
2. Following Commission review, submit for public comment.
3. Prepare proposed updated program plan for next phases of work and submit for Commission consideration. (OPE, December 1980.)

D. Policy Paper

1. Evaluate Commission guidance and peer and public comment on the Preliminary Policy Paper (Subtask III.C).
2. Prepare a draft policy statement concerning safety goals, together with underlying rationale, for Commission consideration and public comment (taking item 1 into account). (OPE, 8/12/81.)
3. Identify and plan for further work and submit for Commission consideration. (OPE, August 1981.)

Task IV: WORKSHOPS

Note: This task envisages holding two workshops, to help illuminate the considerations that should guide the narrowing of options. These will be discussion workshops, with assigned topics (and perhaps subtopics assigned to subgroups), involving invited knowledgeable persons representing a broad range of viewpoints, drawn from technical, social, and humane disciplines, industry, public interest groups, universities, and government. The composition of the two workshops is not expected to be identical. The proposed workshops and associated tasks are as follows:

A. Workshop on Frameworks and Philosophies of Approach

1. Prepare and provide to participants an input package including the Preliminary Policy Paper and topics and guidelines for discussion.
2. Hold workshop to discuss general approaches to safety-goal formulation, including goal forms, assumptions, and decision criteria. (Arrangements responsibility to be determined; February 1981.)
3. Prepare report, for use in Subtasks IV.B and III.D.

B. Workshop on Proposed Approach

1. Prepare and provide to participants an input package including the Preliminary Policy Paper, preliminary draft of proposed approach, report on Workshop A, and topics and guidelines for discussion.
2. Hold workshop to discuss merits and problems of a reference safety-goal statement and its chief alternatives. (Arrangements responsibility to be determined; June 1981.)
3. Prepare report, for use in Subtask III.D.

Task V: MANAGEMENT

1. Plan, organize, and integrate the project.
2. Measure progress and adjust the program in light of Commission guidance and other developments. (OPE, with assistance of Inter-Office Steering Group.)

5. Public Participation

Wide public participation will be sought.

This plan will be published in the Federal Register, with opportunity for public comments and suggestions for consideration in the Preliminary Policy Paper.

The two workshops will be open to the public.

The Preliminary Policy Paper and the Policy Paper will be issued for public comment, and consideration will be given to possible invitations of comment on other papers.

One or more public meetings will be held, to provide further occasion for public input.

6. Organization

The Commission has assigned the principal program responsibility to OPE.

An Inter-Office Steering Group is being established to gain the benefit of NRC-wide participation in guidance of the program and to serve as a focal point for securing work contributions from the various NRC offices. The offices represented include OPE, OGC, RES, NRR, SD, IE, and NMSS. In addition, an ACRS staff member will participate. The members are being chosen on the basis that they should be broadly capable professionals, of inquiring mind, and not averse to challenging established ways. Their participation will be part-time, with a priority adequate to the program's schedule. They are being appointed by the respective Office Directors (or Committee Chairman), with approval of the EDO in the case of offices reporting through the EDO. The group's chairman will be the Director, OPE.

OPE and the steering group will be further assisted in program guidance by outside consultants.

The study work will be done partly by assignment of specific work packages to appropriate NRC offices, contractors, and consultants.

Consideration will be given to retaining the services of a national laboratory for "housekeeping" and other contractual support of the goal-development effort.

7. Program Adjustment

As the work progress, OPE, in consultation with the Inter-Office Steering Group, will develop any needed modifications of this plan, in consonance with the program's objectives, scope and overall schedule, and in accordance with Commission guidance.

STATUS OF NRC WORK

• OGC:

OGC has submitted for the Commission's information a legal analysis of NRC's present requirements and practices with respect to safety adequacy. ("Adequate Protection of the Health and Safety of the Public," memo to the Commission from L. Bickwit, GC, 10-18-79.)

• ACRS:

In May 1979 the ACRS recommended to the Commission that NRC consider the establishment of quantitative safety goals for nuclear power reactors. (Letter to NRC Chairman Hendrie from ACRS Chairman Carbon, 5-16-79.) After expression of interest by Commissioner Ahearne (letter to Chairman Carbon, 6-11-79), the ACRS undertook to develop the concept further and assigned the project to its Subcommittee on Reliability and Probabilistic Assessment. In August 1979 the ACRS wrote that it would take up to a year to arrive at a recommendation that the Committee would find appropriate. (Letter to Commissioner Ahearne from ACRS Chairman Carbon, 8-14-79.) After a series of meetings which included consideration of a number of domestic and foreign risk-analysis and criteria-development programs, the Subcommittee presented a tentative framework for risk management decision-making to the Committee at its June 1980 meeting.

The ACRS Subcommittee on Reliability and Probabilistic Assessment met on July 1, 1980 to continue its evaluation of development of quantitative safety goals for nuclear power plants. Speakers from NRC's Probabilistic Analysis Staff (RES), EPRI, AIF, IEEE, and General Atomic, as well as ACRS Fellows and consultants presented and discussed proposed approaches. Based on the information provided to the Subcommittee through its July 1, 1980 meeting, Subcommittee Chairman Okrent informed the Committee on July 12 that he and ACRS Fellows working with him would prepare a draft letter for Committee review at the September or October 1980 ACRS meeting. The draft is expected to be accompanied by background documents describing:

-- Approaches to safety goals found in the literature.

-- A possible set of safety goals and decision rules, and their implications.

It is expected that the ACRS will report its findings to the Commission after its September or October 1980 meeting.

• Office of Nuclear Regulatory Research:

The Office of Nuclear Regulatory Research has in progress a research program on quantification of safety decision-making. The specific activities involved and their status are as follows:

-- A Comparative Risk Assessment and Acceptable Risk Criteria project is being conducted by the Oak Ridge National Laboratory to develop methods for addressing unacceptable and acceptable risk, and to compare public and occupational risk associated with the coal and nuclear fuel cycles. A preliminary draft of a report on Approaches to Acceptable Risk is presently being reviewed, and a draft report on the risk associated with the coal and nuclear fuel cycles is being finalized for distribution in October 1980.

-- A research task force of a variety of professional disciplines has been established to formulate several possible sets of numerical criteria, using different technical approaches. The formation of the research task force and the conduct of its meetings are being coordinated through the Institute of Electrical and Electronic Engineering (IEEE), with cooperation from other professional engineering societies. The task force has been established in the IEEE SC-5 Reliability Committee, and has completed several working group meetings as of June 1980. Discussions are currently taking place among IEEE, ANS, and AIF concerning the respective roles of these organizations, in efforts to arrive at a coordinated approach.

-- Brookhaven National Laboratory has been contracted to independently formulate criteria in order to investigate the implications of such criteria and to determine the impact of attempting to satisfy such

criteria. Information on risk exposure and risk acceptance criteria from other societal activities is being collected. Draft reports are expected in September 1980. Also, baseline calculations of WASH-1400 accident sequence probabilities are being revised by using hardware and human error failure rates.

- As means of peer review during the BNL project, the National Science Foundation, the National Academy of Science, and the American Statistical Association have been contacted to set up peer review functions. Negotiations are underway to define the specific mechanisms for these peer reviews. The ACRS Subcommittee on Probabilistic Analysis are carrying out independent reviews and formulating their own recommendations.

- Several meetings are scheduled to accomplish an integration of these activities. A meeting of nuclear industry representatives was held in Washington, D.C., on March 18, 1980 to discuss fundamental issues involved in establishing risk criteria. It is anticipated that one or more of these meetings will be internationally sponsored.

Task descriptions and schedules of the various RES-sponsored efforts appear in Appendix B.

- Office of Nuclear Reactor Regulation:

On July 10, 1980 the NRR's Division of Safety Technology (DST) circulated for comment within NRC a draft paper entitled, "Concepts, Problems, and Issues in Developing Safety Goals and Objectives for Commercial Nuclear Power." In October 1980, DST plans to issue a revised and expanded draft, which is expected to include a fuller treatment of suggested goal forms and assumptions for the goals, together with a rationale for decision criteria for choosing among candidate sets of interrelated goals, standards, and guidelines. In addition, DST is prepared to develop a paper on the desirability of specific safety goals. The paper would be drafted from a licensing perspective and would be intended as a proposed "NRC staff" alternative, for consideration along with other viewpoints.

DESCRIPTION OF RES-SPONSORED PROJECTS

PROJECTS TO FORMULATE AND EVALUATE
QUANTITATIVE RISK CRITERIA

Performing Organization: Brookhaven National Laboratory

- Task 1. Perform a comprehensive literature review on published articles addressing quantitative risk criteria. Revised draft report due September 15, 1980.
- Task 2. Update WASH-1400's curves and tables on risks from activities other than nuclear. Evaluate both individual and societal risks along with associated uncertainties. Revised draft report due September 15, 1980.
- Task 3. Review present state-of-the-art of fault tree and event tree modeling and quantitative risk evaluations. Explicitly identify limitations and capabilities in utilizations to determine whether numerical risk criteria are satisfied. Draft report due September 15, 1980.
- Task 4. Update WASH-1400 calculations to incorporate new failure data and new quantitative models. The updated WASH-1400 evaluations will serve as baselines to compare with risk evaluations of other plants. Coding of WASH-1400 fault trees and event trees for automatic computer updating to be completed by October 1, 1980.
- Task 5. Based on comparative risk considerations, formulate and evaluate quantitative risk criteria based on an acceptable level approach. Consider quantitative criteria for acceptable levels for:
- a. core melt probability
 - b. probability versus curies released
 - c. early fatalities
 - d. latent fatalities
 - e. dollar damage

Evaluate different criteria and give the pros and cons for utilizing each criterion along with the risk ramifications. Consider different methods for compliance determinations. Specifically address the treatment of uncertainties and data and models required. Draft report due September 15, 1980.

- Task 6. Formulate and evaluate quantitative criteria based on an unacceptability level approach. Consider the same five items as for the acceptable level approach. Consider ramifications and methods for determining compliance. Specifically address the treatment of uncertainties along with data and models required. Draft report due September 15, 1980.

(Note: Final reports will be issued in 1981.)

Performing Organizations: Oak Ridge and Decision Research
(Paul Slovic, Ralph Keeney, etc.)

- Task 1. Consider the comments and reviews made on the draft report of Approaches to Acceptable Risk and issue a final report. Final report due October 1, 1980.
- Task 2. Formulate and evaluate specific quantitative criteria for acceptable levels of risk from nuclear reactors. Consider quantitative levels for core melt probability, probability versus release, early and latent fatalities, and dollar damage. Consider the different approaches for justifying the criteria (expert judgment, comparative arguments, decision-theoretic approaches, etc.) and discuss possible public reactions. Evaluate ramifications of the criteria and specifically consider methods for implementing and determining compliance with the criteria. Draft report due January 1981.
- Task 3. Consider quantitative criteria based on the unacceptable level approach. Perform the same analyses as in Task 1 but addressing

defined, unacceptable quantitative criteria. Also consider how the unacceptable level approach might converge to the acceptable level approach. Draft report due January 1981.

Performing Organizations: Oak Ridge and Science Applications

Task Complete final report on evaluating risks from coal versus nuclear power. The report treats all phases of the nuclear fuel cycle and coal cycle. Final report due October 1, 1980.

Performing Organization: Argonne National Laboratory

Task 1. Begin to quantify the benefits from nuclear power for considerations in risk-benefit evaluations. As phase one of this task, specifically consider the loss of economic benefits from shutdown of one plant or multiple plants. Utilize existing computer codes and consider specific plant shutdowns covering minimum to maximum losses. Consider multiple plant shutdowns by region. Develop an empirical model for decision-theoretic utilizations. Draft report due December 1, 1980.

Task 2. Apply decision-theoretic approaches to regulatory decision-making. Explain in understandable terminology the concepts and inputs required in utilizing formal decision-theoretic approaches. Use the models and analyses obtained from IREP as specific case studies. Perform detailed sensitivity studies to determine the impacts of different value assessments. Develop a formal treatment for handling uncertainties in the decision-making process. Draft report due March 1981.

Note: In addition to the above projects, the IEEE has established working groups to formulate numerical risk criteria from an industry-oriented point of view. The National Academy of Science and National Science Foundation has carried out several forums on acceptable risk criteria. The American Statistical Association has also established a committee dealing with the proper use of statistics in risk analyses.

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| 16. ABSTRACT (200 words or less) <p>This report presents a Commission-approved plan for development and articulation of NRC safety objectives, notably -- but not exclusively -- with respect to power reactors; with special attention to interim objectives attainable in the near term, but including consideration of an overall program as well. The plan provides for preparing, for Commission consideration and public comment, a preliminary policy paper by December 29, 1980 and a policy paper reflecting subsequent work by August 12, 1981. The policy articulation to be developed will include some general approach to risk acceptability and safety-cost tradeoffs, and, to the extent that these reasonably lend themselves to articulation, quantitative safety goals, safety improvement goals, and standards for review of past actions in light of new rules and improved practices.</p> | | | | 9. (Leave blank) | |
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