



RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) REQUEST

2017-0575

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RESPONSE TYPE

INTERIM

FINAL

REQUESTER:

Edward Burns

DATE:

8/11/2017

DESCRIPTION OF REQUESTED RECORDS:

SECY-89-328, Use of Probabilistic Risk Assessment in Resolving Safety Issues, dated October 24, 1989 (ML12251A683)

PART I. -- INFORMATION RELEASED

You have the right to seek assistance from the NRC's FOIA Public Liaison. Contact information for the NRC's FOIA Public Liaison is available at <https://www.nrc.gov/reading-rm/foia/contact-foia.html>

- Agency records subject to the request are already available on the Public NRC Website, in Public ADAMS or on microfiche in the NRC Public Document Room.
- Agency records subject to the request are enclosed.
- Records subject to the request that contain information originated by or of interest to another Federal agency have been referred to that agency (see comments section) for a disclosure determination and direct response to you.
- We are continuing to process your request.
- See Comments.

PART I.A -- FEES

NO FEES

AMOUNT*

\$0.00

*See Comments for details

You will be billed by NRC for the amount listed.

You will receive a refund for the amount listed.

Fees waived.

Minimum fee threshold not met.

Due to our delayed response, you will not be charged fees.

PART I.B -- INFORMATION NOT LOCATED OR WITHHELD FROM DISCLOSURE

- We did not locate any agency records responsive to your request. *Note:* Agencies may treat three discrete categories of law enforcement and national security records as not subject to the FOIA ("exclusions"). 5 U.S.C. 552(c). This is a standard notification given to all requesters; it should not be taken to mean that any excluded records do, or do not, exist.
- We have withheld certain information pursuant to the FOIA exemptions described, and for the reasons stated, in Part II.
- Because this is an interim response to your request, you may not appeal at this time. We will notify you of your right to appeal any of the responses we have issued in response to your request when we issue our final determination.
- You may appeal this final determination within 90 calendar days of the date of this response by sending a letter or e-mail to the FOIA Officer, at U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or FOIA.Resource@nrc.gov. Please be sure to include on your letter or email that it is a "FOIA Appeal." You have the right to seek dispute resolution services from the NRC's Public Liaison, or the Office of Government Information Services (OGIS). Contact information for OGIS is available at <https://ogis.archives.gov/about-ogis/contact-information.htm>

PART I.C COMMENTS (Use attached Comments continuation page if required)

Please note:

The attached following responsive record is being released in its entirety:

ML12251A683

Signature - Freedom of Information Act Officer or Designee



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October 24, 1989

SECY-89-328

POLICY ISSUE
(Information)

For: The Commissioners

From: James M. Taylor
Acting Executive Director
for Operations

Subject: USE OF PROBABILISTIC RISK ASSESSMENT IN RESOLVING SAFETY ISSUES

Purpose: To inform the Commission of staff practices in the use of probabilistic risk assessment (PRA) in resolving safety issues. (Staff Requirements Memorandum M890413B, dated April 20, 1989.)

Summary: During the staff's briefing of the Commission on April 13, 1989 on plans for implementing the Safety Goal Policy, the Chairman suggested that the staff may wish to make additional recommendations to the Commission on this subject. After reviewing existing guidance on this matter, the staff has concluded that no additional recommendations on the use of PRA in resolving safety issues, beyond that incorporated in SECY 89-102, "Implementation of Safety Goal Policy," are needed at this time.

This paper identifies guidance that has been given to the staff to date. It also describes the use of PRA results to estimate the potential benefits of proposed resolutions.

Background: The use of PRA by the staff as a factor in making safety decisions, subject to qualifications, was authorized by a statement issued by the Commission dated January 18, 1979 and entitled "NRC Statement on Risk Assessment and the Reactor Safety Study Report (WASH-1400) in light of the Risk Assessment Review Group Report." It was attached to a memorandum from the Secretary of the Commission to the Executive Director for Operations, also dated January 18, 1979, providing instructions from the Commission to the Staff (Enclosure). Among other things the instructions included the following:

Contact: R. W. Houston, RES
X23900

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"Quantitative risk assessment techniques may be used to estimate the relative importance of potential nuclear power plant accident sequences or other features where sufficient similarity exists so that comparisons are not invalidated by lack of an adequate data base.---"

Subsequently the staff began its development and application of guidelines (NUREG/BR-0058) for the conduct of regulatory analyses. A companion document prepared for staff use, a Handbook for Value Impact Assessment (NUREG/CR-3568), issued in December 1983, provides supplementary guidance that recognizes that PRA would usually be involved in regulatory analyses for potential new regulatory requirements arising from safety issues.

In January 1983, the Commission published in NUREG-0885, Issue 2, "US NRC Policy and Planning Guidance" the following, under the heading "Risk Assessment":

Policy

- A. Probabilistic risk assessment is a useful tool for weighing risks against one another and for estimating achieved safety levels. Quantitative risk assessment techniques will be used judiciously by the Staff and the boards as directed by the Commission to estimate the relative importance of potential nuclear power plant accident sequences.

Planning Guidance

1. Special attention should be given to using probabilistic assessment techniques in the evaluation period for safety goals, as directed by the Commission, and in other regulatory applications especially amenable to risk assessment, e.g., in dealing with generic safety issues, formulating new regulatory requirements, assessing and revalidating or eliminating existing regulatory requirements, evaluating new designs, and setting reactor safety research and inspection priorities.
2. Consideration will be given to the uncertainties associated with existing probabilistic risk assessment techniques whenever used in regulatory decisions.

The Commission approved charter of the Committee to Review Generic Requirements (CRGR) recognizes the use of "probabilistic risk assessment where data for its proper use are adequate."

In the development and publication of the Commission's Safety Goal Policy Statement dated August 4, 1986, a relationship between PRA and quantitative objectives was clearly recognized, and the Commission authorized the staff to use the two Quantitative Health Objectives to gauge achievement of the safety goals.

The Second Draft NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants" was published for peer review in June 1989. This document updated and incorporated important advances in PRA technology developed over the last five years. It includes the latest research results on severe accidents, improved core damage and containment performance analysis, and potential effects of external events. The prospective uses of NUREG-1150 as a resource document are described in the Foreword and in Chapter 13. The use of PRA in the process of resolution of safety issues discussed below is consistent with that description.

Discussion:

In virtually all cases in which the staff has employed PRA to assist in the resolution of safety issues it has involved a process that compares results of a PRA treatment on one or more particular plants on a before and after basis. The "before basis" represents a plant for which the safety issue is known or believed to exist. The "after basis" reflects a hypothetical modification that might resolve the issue. The difference so calculated represents an estimate of the net value or benefit of a proposed resolution. The recently completed NUREG-1150 analyses provide models which can be used to evaluate new issues in a similar fashion in the future.

A gauge of a prospective increase in protection of the public used by the staff is the estimate of the net reduction in population dose (person-rem). This requires the use of PRA treatments to estimate source terms (Level 2) and to carry out consequence calculations (Level 3). Core damage frequencies (Level 1) enter the calculations to estimate the annualized consequences which are then summed over the expected (remaining) life of the plant. In regulatory analyses carried out pursuant to the backfit rule, 10 CFR 50.109, the staff generally employs the cost-benefit guideline ratio (\$1000/person-rem) directly,

and does not have a separate and distinct rule-of-thumb benchmark for the benefit expressed as a reduction in person-rem. In practice, however, it is found that cost-benefit ratios that might justify regulatory action tend to show population dose reductions averaging greater than a few hundred person-rem per year over the expected balance of plant life. Thus, a population dose reduction in this range or greater is judged by the staff to represent "a substantial increase in the overall protection of the public health and safety---." [10 CFR 50.109 (a) (3)]

The resolution of some safety issues can reduce the probability of core damage or core melt. In these cases the staff typically uses a Level 1 PRA to estimate a net reduction in core damage frequency (CDF). In itself this is a useful gauge of potential safety benefit and is an indirect measure of increased protection of the public. This focus on core damage reflects the importance of prevention of core damage, the fact that Level 1 PRA information is generally more robust than Level 2 and 3, and is consistent with the accident prevention philosophy embodied in several major rulemaking initiatives (e.g., ATWS, ECCS, Station Blackout, and Appendix R). There are two safety issues, however, for which the staff developed specific quantitative resolution objectives that focus on core damage frequency. These are discussed below.

The Station Blackout Issue: USI A-44

In the regulatory analysis for the resolution of the station blackout issue (NUREG-1109, June 1988), the following statement appears under the heading of Objectives:

"The general objective of the requirements to resolve USI A-44 is to reduce the risk of severe accidents associated with station blackout by making station blackout a relatively small contributor to the average frequency of core damage for the total population of plants." (Underline added for emphasis.)

Thus, the intended comparative test of significance focused on the relative residual contribution to an integrated total CDF, rather than the magnitude of expected reduction. The staff recognized that this would literally require a PRA on every plant in order to measure "the average frequency of core damage for the total population of plants." On the basis of existing PRAs, however, the staff estimated that such an average CDF would likely be of the order of 1 in

10,000 per reactor year. Informally the staff then set as its goal a contribution to CDF from station blackout events of 10% of that estimated average, i.e., 1 in 100,000 per reactor year. This approach had its origin in the partitioning process and sequence level probabilistic targets derived for the process of prioritizing generic safety issues (NUREG-0933). The regulatory analysis for the resolution of the station blackout issue showed that this goal should be closely achieved by the station blackout rule.

The Decay Heat Removal Issue: USI A-45

The second safety issue for which the staff set a similar goal dealt with Shutdown Decay Heat Removal Requirements. As described in SECY-88-260, September 13, 1988, in this case the goal set was that the overall residual contribution to core damage due to failure of the decay heat removal function should be less than 1 in 100,000 per reactor year. It was also noted that this was approximately the same as was expected to be achieved by the resolution of the station blackout issue, as indicated above.

Relation to Safety Goal Policy

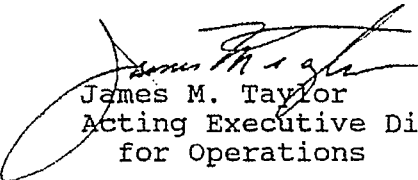
The staff has recommended in SECY-89-102, March 30, 1989, Implementation of Safety Goal Policy, the use of a quantitative objective for overall core damage frequency as an integrated benchmark against which prospective changes in regulatory requirements could be gauged. The objective recommended was 1 in 10,000 per reactor year, integrated over all core damage sequences. This is part of the hierarchy of quantitative objectives in the recommended implementation process.

The staff also recommended the use of subsidiary objectives that represent a partitioning of the overall core damage frequency objective. (Section C.3 of SECY 89-102). This partitioning represents an allocation of the overall CDF to individual classes of events. The approach used in the resolution process for the two issues described above is consistent with these staff recommendations on the use of quantitative objectives in the implementation of Safety Goal Policy.

Conclusion:

At the present time the staff is not directly using an overall CDF target of 1 in 10,000 per reactor year in the generic issue resolution process but would do so with Commission approval of the recommendations in SECY 89-102.

The staff believes that its recommendations on CDF objectives should not be isolated from the broader plan for implementing the Safety Goal Policy.



James M. Taylor
Acting Executive Director
for Operations

Enclosure: As stated

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OFFICE OF THE
SECRETARY

UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555

January 18, 1979

MEMORANDUM FOR: Lee V. Gossick
Executive Director for Operations

FROM: Samuel J. Chilk
Secretary of the Commission

SUBJECT: STAFF ACTIONS REGARDING RISK ASSESSMENT
REVIEW GROUP REPORT

Attached is a policy statement issued by the Commission on January 18, 1979. In addition, the Commission has provided the following instructions for the staff.

1. Send copies of the Risk Assessment Review Group Report (NUREG/CR-0400) and of the January 18, 1979 Commission policy statement to all known domestic and international recipients of the RSS. In the future, copies of the RSS Executive Summary and the complete RSS will be distributed only when accompanied by a copy of the Review Group's report and a copy of this statement.
2. Quantitative risk assessment techniques and results can be used in the licensing process if proper consideration is given to the results of the Review Group. The staff should use the following procedures regarding the use of quantitative risk assessment techniques and results pending development of further guidance:
 - a. In comparisons of risks from nuclear power plants with other risks, the overall risk assessment results of the RSS (i.e., curves or tables of the probability of occurrence of various consequences) shall not be used without an indication of the wide range of uncertainty associated with those estimates. Any such use should note the difficulty of placing high confidence on estimates that are well below the values set by experience.

- b. Quantitative risk assessment techniques may be used to estimate the relative importance of potential nuclear power plant accident sequences or other features where sufficient similarity exists so that the comparisons are not invalidated by lack of an adequate data base. Such techniques should not be used to estimate absolute values of probabilities of failure of subsystems unless an adequate data base exists, and it is possible either to quantify the uncertainties or to support a conservative analysis.
- c. The quantitative estimates of event probabilities in the RSS should not be used as the principal basis for any regulatory decision. However, these estimates may be used for relative comparisons of alternative designs or requirements provided that explicit considerations are given to the criticisms of those estimates as set forth in the Report of the Risk Assessment Review Group.
- d. The RSS consequence model shall not be used as the basis for licensing decisions regarding individual nuclear power plant sites until significant refinements and sensitivity tests are accomplished. However, the consequence model may be used for relative comparisons provided that such estimates are not the primary basis for such reviews and provided that explicit consideration is given to the criticisms of the various elements of that model as set forth in the Report of the Risk Assessment Review Group.

The staff shall prepare and submit by June 30, 1979, detailed procedures to ensure the proper and effective use of risk assessment theory, methods, data development and statistical analyses by the staff. Pending review by the Commission of these detailed procedures and the bases and rationale supporting them, the Office Directors will obtain the advice of the EDO's Regulatory Requirements Review Committee should questions arise regarding the implementation of the above instructions.

3. The staff shall review the extent to which past and pending licensing or other regulatory actions, including Commission, ACRS and licensing board actions and statements, have relied on the risk assessment models and risk estimates of the RSS. The Commission will examine the results of this review to determine whether the degree of reliance identified was and continues to be justified and to decide whether regulatory modifications are appropriate.

4. The staff shall give special attention to those activities identified by the Review Group as being especially amenable to risk assessment, i.e., dealing with generic safety issues, formulating new regulatory requirements, assessing and re-validating existing regulatory requirements, evaluating new designs, and formulating reactor safety research and inspection priorities

5. The staff shall prepare a review of current NRC practices and procedures in two areas of particular concern to the Review Group:

- a. the peer review process for risk assessment developments, and
- b. the coordination among the research and probabilistic analysis staff and the licensing and regulatory staff, in order to promote the effective use of these techniques.

The Commission will make whatever changes are necessary to assure that effective peer review and interoffice coordination are integral features of NRC's risk assessment program.

6. The staff shall examine the significance of the technical issues raised by the Review Group and the appropriate courses of action for dealing with them. These issues include questions about statistical methods, data base quality and availability, consequence modeling, human factor considerations, earthquakes, fires, and common cause failures. The Commission will address what changes should be proposed in the approved FY 79 and proposed FY 80 research program to improve the data base, including that on human behavior. As an additional action, the staff shall undertake a review of statistical methods and human factor considerations used in risk assessment.

Attachment:
As stated

cc: Chairman Hendrie
Commissioner Gilinsky
Commissioner Kennedy
Commissioner Bradford
Commissioner Ahearne
James L. Kelley, DGC
Kenneth Pedersen, OPE
Joseph J. Fouchard, OPA
Carlton C. Kammerer, OCA

I. STATEMENT ON RISK ASSESSMENT AND
THE REACTOR SAFETY STUDY REPORT (WASH-1400)
IN LIGHT OF THE RISK ASSESSMENT REVIEW GROUP REPORT

The Risk Assessment Review Group, chartered by the NRC in July, 1977 to "provide advice and information to the Commission on the final report of the Reactor Safety Study, WASH-1400," and related matters, ^{1/} submitted its report to the Commission on September 7, 1978. The Review Group, chaired by Professor Harold Lewis of the University of California at Santa Barbara, ^{2/} was formed in response to letters from Congressman Udall, Chairman of the House Committee on Interior and Insular Affairs, expressing misgivings about the Reactor Safety Study (WASH-1400), and in particular about the "Executive Summary" published with the Main Report. It was expected that the Review Group's report would "assist the Commission in establishing policy regarding the use of risk assessment in the regulatory process" and that it would "clarify the achievements and limitations of the Reactor Safety Study."

In August, 1972, the Chairman of the Atomic Energy Commission informed the Chairman of the Joint Committee on Atomic Energy that the Atomic Energy Commission had undertaken an in-house study "to provide a basis for submitting recommendations to the Congress regarding the extension or modification of the Price-Anderson Act." A draft version of the study report was circulated for comment in April, 1974. On October 30, 1975, the Nuclear Regulatory Commission ^{3/} announced that the final report had been completed. Criticism of the document following release centered on the method of treating peer comments on the draft report as well as on the substance of the report. The NRC press release accompanying publication of WASH-1400 praised the report, describing it as a "realistic assessment..., providing an objective and meaningful estimate of the present risks associated with the operation of present day light water reactors in the United States," gave several comparisons to show that the risk from nuclear power was much less than from other man-made activities, and included a statement that "the final report is a soundly based and impressive work.... Its overall conclusion is that the risk attached to the operation of nuclear power plants is very low compared with other natural and man-made risks." ^{4/}

In view of the importance attached to the Reactor Safety Study, within and outside the Commission, both prospectively and after it was made public, the Commission has reexamined its views regarding the Study in light of the Review Group's critique.

While praising the study's general methodology and recognizing its contribution to assessing the risks of nuclear power, the Review Group was critical of the Executive Summary, the procedure followed in producing the final report and the calculations in the body of the report.

Among the major failings of the study, the Review Group cited:

The Executive Summary: The Review Group concluded that "the Executive Summary of the RSS is a poor description of the contents of the report, should not be portrayed as such, and has lent itself to misuse in the discussion of reactor risks." The Review Group indicated the Executive Summary does not adequately indicate the full extent of the consequences of reactor accidents and does not sufficiently emphasize the uncertainties involved in the calculations of their probability. As a result, the reader may be left with a misplaced confidence in the validity of the risk estimates and a more favorable impression of reactor risks in comparison with other risks than warranted by the study. 5/

The Peer Review Process: The Review Group Report criticized the RSS staff response, pointing out that in some cases cogent comments from critics either were not acknowledged or were evaded and that, in general, the record of response to valid criticism was weaker than it should have been. The Report points out that the lack of clarity of WASH-1400 itself led to major difficulty in tracing a line of thought through the study and crippled many efforts to accomplish responsible peer reviews.

Accident Probabilities: The Review Group was unable to determine whether the absolute probabilities of accident sequences in WASH-1400 are high or low, but believes that the error bounds on those estimates are, in general, greatly understated. This, the Report said, is true in part because there is in many cases an inadequate data base, in part because of an inability to quantify common cause failures, and in part because of some questionable methodological and statistical procedures.

The Review Group also criticized, in some cases severely, various of the calculational techniques in the Study as well as its lack of clarity.

The Review Group cited the following as major achievements of the study:

"WASH-1400 was a substantial advance over previous attempts to estimate the risks of the nuclear option.

"WASH-1400 was largely successful in at least three ways; in making the study of reactor safety more rational, in establishing the topology of many accident sequences, and in delineating procedures through which quantitative estimates of the risk can be derived for those sequences for which a data base exists.

"Despite its shortcomings, WASH-1400 provides at this time the most complete single picture of accident probabilities associated with nuclear reactors. The fault-tree/event-tree approach coupled with an adequate data base is the best available tool with which to quantify these probabilities.

"WASH-1400 made clear the importance to reactor safety discussions of accident consequences other than early fatalities."

The Commission accepts these findings and takes the following actions:

Executive Summary: The Commission withdraws any explicit or implicit past endorsement of the Executive Summary.

The Peer Review Process: The Commission agrees that the peer review process followed in publishing WASH-1400 was inadequate and that proper peer review is fundamental to making sound, technical decisions. The Commission will take whatever corrective action is necessary to assure that effective peer review is an integral feature of the NRC's risk assessment program.

Accident Probabilities: The Commission accepts the Review Group Report's conclusion that absolute values of the risks presented by WASH-1400 should not be used uncritically either in the regulatory process or for public policy purposes and has taken and will continue to take steps to assure that any such use in the past will be corrected as appropriate. In particular, in light of the Review Group conclusions on accident probabilities, the Commission does not regard as reliable the Reactor Safety Study's numerical estimate of the overall risk of reactor accident.

Communication with the Congress and the Public: Commission correspondence and statements involving WASH-1400 are being reviewed and corrective action as necessary will be taken.

With respect to the component parts of the Study, the Commission expects the staff to make use of them as appropriate, that is, where the data base is adequate and analytical techniques permit. Taking due account of the reservations expressed in the Review Group Report and in its presentation to the Commission, the Commission supports the extended use of probabilistic risk assessment in regulatory decisionmaking.

The Commission has provided additional detailed instructions to the NRC staff concerning continued use of risk assessment techniques and results in response to specific criticisms raised by the Risk Assessment Review Group.

NOTES

- 1/ Its charter reads: "The Review Group will provide advice and information to the Commission regarding the final report of the Reactor Safety Study, WASH-1400, and the peer comments on the Study, advice and recommendations on developments in the field of risk assessment methodology and on future courses of action which should be taken to improve this methodology and its application. This advice and information will assist the Commission in establishing policy regarding the use of risk assessment in the regulatory process, in improving the base for the use of such assessments. It will also clarify the achievements and limitations of the Reactor Safety Study."
- 2/ The other members were Dr. Robert J. Budnitz (Lawrence Berkeley Laboratory, University of California), Dr. Herbert J. C. Kouts (Brookhaven National Laboratory), Dr. Walter Loewenstein (Electric Power Research Institute), Dr. William Rowe (Environmental Protection Agency), Dr. Frank von Hippel (Princeton University) and Dr. Fredrik Zachariassen (California Institute of Technology). Dr. Budnitz is presently on leave from the University of California and is serving (since August 1978) as Deputy Director of the NRC's Office of Nuclear Regulatory Research.
- 3/ The Nuclear Regulatory Commission was established on January 19, 1975 to carry out the regulatory functions of the Atomic Energy Commission, which was abolished on that date.
- 4/ The press release at the time of publication said that the report is "the culmination of the most comprehensive risk assessment of nuclear power plants made to date. The objectives of the study were to make a realistic assessment.... The overall conclusion... is that the risks attached to the operation of present day nuclear power plants are very low compared to other natural and man-made risks.... Nuclear power plants are about 10,000 times less likely to produce fatal accidents than man-made non-nuclear activities.... Non-nuclear accidents involving comparable large dollar value damage are about 1,000 times more likely than nuclear power plant accidents.... The chance that a person living in the general vicinity of a nuclear power plant will be fatally injured in a reactor accident is one in five billion per year.... In the event of an unlikely reactor accident with a probability of one in a million per reactor per year, latent health effects except for thyroid nodules would be such a small percentage of the normal incident rates that they would be difficult to detect...."

The NRC Chairman was quoted as saying, "The Commission believes that the Reactor Safety Study Report provides an objective and meaningful estimate of the public risks associated with the operation of present day light water reactors in the United States.... The final report is a soundly based and impressive work.... Its overall conclusion is that the risk attached to the operation of nuclear power plants is very low compared with other natural and man-made risks." The press release went on to say that more than 1800 pages of comments were received from a broad spectrum of people and all were carefully considered in preparing the final report.

- 5/ Professor Lewis, in reporting to the Commission, said that the Executive Summary was not a summary of the report. He concluded it was written as a public statement that reactors were safe compared to other risks to which the public is exposed and he stated it should not have been attached to the report and described as a part of it.