



OFFICE OF THE SECRETARY

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 18, 1979

NUREG/REG/ADM - ACTION

Cys: Gossick
Rehm
Minogue
Dircks
Davis
Shapar
Ryan
Siga
Besaw
Hayden

MEMORANDUM FOR: Lee V. Gossick
Executive Director for Operations

FROM: Samuel J. Chilk
Secretary of the Commission *SC*

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. *(ADM - Suspense 2/12/79) Cover letter signed by Secy will be provided*
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.

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- 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 ^{Agency} 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. (NRR)

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. (NRR/MPA) Suspense 3/1/79

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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. (MPA provide COORDINATED PLAN to EDO w/ suspension by 2/1/79)

5. The staff shall prepare a review of current NRC practices and procedures in two areas of particular concern to the Review Group: (MPA) (Provide Return w/ suspension by 2/1/79)

- 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 ^{a)}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. ^{b)}As an additional action, the staff shall undertake a review of statistical methods and human factor considerations used in risk assessment. (MPA/RES)

Provide Return w/ suspension by
2/1/79

Attachment:
As stated

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

January 18, 1979

NRC 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.

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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.

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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...."

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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.