UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 22, 1993

MEMORANDUM FOR: James M. Taylor
Executive Director for Operations

FROM: Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

SUBJECT: DRAFT REPORT OF THE PRA WORKING GROUP

In October 1991, you established the PRA Working Group to address concerns identified by the ACRS with respect to the staff's uses of PRA. These concerns related to unevenness and inconsistency in the staff's uses of PRA. Since that time, the Working Group has developed and has been executing its plans.

The Working Group has provided the ACRS with two status reports, the first on its general plans (in April 1992) and the second on its progress (in October 1992).

The Working Group has also organized an external review performed by experts in risk analysis, statistics, decision theory, safety analysis, and NRC's regulatory process. These experts were briefed on the group's general plans (in October 1992) and reviewed a draft report (in February 1993). They provided written comments in March 1993 (enclosed). The Group has subsequently reviewed these comments and developed a revised draft report reflecting the comments. This revised draft is enclosed for your information, with highlights summarized below.

The Working Group has also provided two status reports to the Commission. SECY-92-273 (in August 1992) provided a description of the Group's general plans. SECY-92-428 (in December 1992) summarized the results of the Group's survey of present staff PRA uses and the limitations identified by the Group in these uses.

By copy of this memorandum, the ACRS is being provided the revised Working Group report for review and discussion in a May 1993 subcommittee meeting. A copy is also being provided to the external reviewers, who have indicated that they may want to provide additional review and comment.

Summary of the Working Group's report

The Working Group's first two tasks involved identifying how the staff was now using PRA and what limitations existed in these uses. As indicated in the SECY-92-428, some key results of a survey of staff PRA uses included:

o Almost all of the staff surveyed had taken one or more of the NRC training courses; however,

- Many staff surveyed had limited (less than one year) experience with PRA techniques; and

- Staff surveyed also indicated limited experience and familiarity with PRA-related technical skills such as statistics.

o In many cases, there was limited or no formal guidance on how to use PRA methods and results in a particular regulatory activity.

o The majority of PRA applications and studies were "level 1" reactor accident PRAs (i.e., with the product being a core damage frequency or change in core damage frequency).

o The majority of these applications by the staff relied on adaptation of existing PRAs.

Given these results, the Working Group developed general guidance for two PRA uses:

o The screening and prioritizing of issues and events, performed in NRR, RES, and AEOD; and

o The detailed analysis of the more significant of these issues and events, also performed in NRR, RES, and AEOD.

The Working Group focused on these two PRA uses because they were widespread in the agency and were found to have essentially no formal PRA-related guidance. The Group has developed initial general guidance for these uses and, as examples, more specific guidance for generic issue prioritizations and detailed analyses.

The Working Group has also made a number of recommendations with respect to additional use-oriented guidance development. The more significant of these and the office or offices involved, are:

o Develop more detailed guidance for other PRA uses related to screening and detailed analyses (e.g., AEOD's studies of operational events), based on the general guidance provided, as well as refine the initial example guidance developed for generic issue prioritizations and detailed analyses (NRR, RES, and AEOD);

o Develop guidance for PRA use in plant-specific licensing actions (e.g. technical specification modifications), including how IPE results should be used (NRR).

o Develop guidance on how IPE results should be used to improve the ongoing PRA-based focusing of inspection activities (NRR).

The Working Group took two principal actions with respect to agency PRA training and skills:

o Recognizing the limited experience of many staff users of PRA (identified in the Group's survey), guidance has been developed by the Group on basic terms and methods in technical areas important to

appropriate uses of PRA by the staff. This guidance provides definitions of terms used in PRA and related skills (with the goal of agency-wide adoption of these definitions), a description of PRA methods commonly applied in the agency's business, including descriptions of the strengths and limitations of each, and a summary of references for obtaining more detailed information.

While a more complete PRA curriculum is being developed (as discussed below), the Group is arranging to have this guidance (contained in the Appendix C of the Group's report) introduced to relevant staff via a workshop. It is expected that the first offering of this workshop will be in the summer of 1993.

- The Group has concluded that the present PRA training program provides an incomplete curriculum relative to the needed staff skills for a number of important agency PRA uses. As such, the Group initiated (via RES) a systematic review of tasks needed to accomplish certain staff functions (i.e., issue/event screening and detailed analysis) and the PRA-related guidance, skills, and training needed to accomplish these tasks. This review uses the job and task analysis portion of the Systems Approach to Training method, also known as Instructional Systems Design and performance-based training, and is expected to be completed at the end of 1993.

  In addition to providing an assessment of the PRA-related guidance and skills needed to accomplish these specific PRA uses, this analysis produces learning objectives which could be used to define training needs. The Group recommends that these learning objectives be used by the Office of Personnel to update the content of the agency's PRA training program.

The Working Group has also made a number of recommendations with respect to staff training and skills. The more significant of these, and the office or offices involved, are:

- The Systems Approach to Training methods noted above should be applied to training to develop the skills required for other major PRA uses within NRC (Table 2.1 of the Group's report provides a list of such PRA uses). As this work is finished, a complete PRA training program should be established (OP).

- PRA is a technical discipline requiring skills in many areas, including facility design and operations, probability, statistics, and reliability methods, human factors, accident analysis methods, atmospheric sciences, and health physics. Adequate use of PRA methods requires that a "critical mass" of all these skills be available within the staff. Considering the current inventory of skills in the agency staff, certain specific skills are both needed and are in particularly short supply. These include statistics, accident analysis (PRA level 2), and offsite consequence (PRA level 3) analysis. The Working Group recommends that people with these skills be emphasized in agency recruitment efforts, to

the extent possible recognizing the agency's limited opportunities for such recruitment efforts. (OP and technical offices).

- The Working Group recommends that the training process developed include a certification of PRA "proficiency." The requirements for this certification would vary according to the type of PRA qualifications necessary for the tasks being performed, which themselves vary with the job being performed (OP).

- A key element to successful use of PRA methods is knowledge of the design and operations of the facility or device under study. Agency training in this area is, in general, provided by the TTC. The development of a comprehensive PRA training curriculum, using SAT methods, should also explicitly identify facility/device design and operation training needs, and be in consonance with the TTC curriculum. Appropriate changes to that curriculum should be made thereafter. (OP, AEOD)

The Working Group also took two principal actions with respect to agency PRA methods:

- The results of the Working Group's survey indicated that most staff adapted existing PRA models in the performance of their analyses, rather than developing new models. While there exists a number of guidance documents for developing PRA models, there is at present no guidance document for adapting PRA models. The Working Group (via RES) is initiating development of such a guidance document. A draft version of the document is expected to be completed near the end of CY 1993. (RES)

- The Working Group's survey found that most reactor event and issue analyses performed by the staff relate to level 1 PRA information (e.g., failures of components or systems preventing core damage). However, the agency's risk-related decision criteria are often in terms of either level 2 or level 3 products (e.g., regulatory analyses use risk information in terms of averted population dose).

  In one case (generic issue prioritization) a simple transformation now exists for converting level 1 to level 3 results. However, this transformation is based on results of the Reactor Safety Study. The Working Group concluded that this present core damage frequency-to-risk transformation should be replaced with information based on NUREG-1150. The Working Group is initiating (via RES) an effort to provide NUREG-1150 results in forms appropriate for such transformations. This work should be completed in FY 1994. (RES)

The Working Group has also made a number of recommendations with respect to additional methods development. The more significant of these, and the office or offices involved, are:

- The Group's survey results indicated that most PRA uses by the staff were adaptations of existing PRAs, rather than new studies. To support such uses, the Group recommends:

- The continuation of PC-based code development (i.e., IRRAS and SARA) with a focus on using such codes to adapt PRA models (RES); and

- The continuation of efforts to put a representative set of modern PRA models in a form usable with the PC-based codes (RES).

o Both the issue screening and issue analysis uses of PRA could benefit from a structured classification of licensed reactors (e.g., structured by design type and containment design), with modern PRAs identified to represent each class. The feasibility of developing such a classification structure for use throughout the agency should be investigated. This feasibility study should consider the present categorization scheme used for accident sequence precursor analyses for broader use throughout the agency (RES, AEOD, NRR).

o It would be beneficial to have detailed PRA models for use in issue analyses which can also be "rolled-up" to more simple models for use in screening analyses. The feasibility of such models is now under study in RES (at the request of AEOD). If feasible, such models should be developed for a representative set of plants (in coordination with the possible classification structure described above) (RES, AEOD, NRR).

o The use of PRA in operational events analyses would benefit from accident sequence analysis methods which can be more readily updated to account for plant design and operational changes, new component or system failure data, etc. The Working Group recommends that the feasibility of such methods for use by the staff be studied. (RES).

Future Plans

As noted above, this draft version of the Working Group's report is being provided to the ACRS for review and discussion at a May 1993 subcommittee meeting, as well as to its external reviewers for possible additional review. Following this meeting and, if needed, additional review meetings, the Group will prepare its final report. If no additional review meetings are needed, the Group expects to transmit the final report to the Commission in June 1993.

The Working Group has recommended that it continue in existence for the next several years, acting to coordinate the completion of its recommendations. The Group has also recommended that a single agency document be designed and developed which summarizes all aspects of NRC's PRA uses (technical and policy). The portion of this document dealing with technical and training

matters would summarize the work initiated by the Group as well as work executed in response to the Group's recommendations, and could be coordinated by the Group.

ORIGINAL SIGNED BY

Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

Enclosures:
Draft PRA Working
Group Report
External reviewers' comments

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

April 9, 1992

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Taylor:

SUBJECT: NRC STAFF PROBABILISTIC RISK ASSESSMENT WORKING GROUP PROGRAM PLAN

During the 384th meeting of the Advisory Committee on Reactor Safeguards, April 2-4, 1992, we discussed the NRC staff PRA Working Group Program Plan. Because we saw nothing but a list of topics to be investigated by the group, and a proposed schedule, we can only comment on those. In particular, the depth of approach to any of the items on the list may turn out to be adequate or inadequate, depending upon the level and quality of effort devoted to the job.

As a general observation, we believe that most of the subjects of relevance are contained in the list. In some cases, that observation depends upon a broad reading of the words - only the implementation of the plan will reveal what was meant. We found no important items that were clearly missing.

We were not able to learn how much effort will actually be devoted to this enterprise, though we were told that the participants were not being relieved of their other duties. We believe that adequate effort is essential, and should be ensured.

We do not know what criteria were used in selecting the outside participants, nor those to be used in selecting the external review group. Where relevant skills are lacking in the staff, it is particularly important that they be present elsewhere.

This enterprise requires time for some education of the Working Group. For example, decision theory appears on the list, and few, if any, staff members are educated in this complex subject. There is an entire discipline here.

We were told that the Working Group was assigned to serve as an oversight group to the staff's effort to use the safety goals in assessing backfit analyses. We have previously expressed discomfort with that effort, and we think it is a mistake to burden this group with that task. It should be dropped from their charge.

We will have more to say as the program plan is fleshed out, and as we become more familiar with the skills of the participants we haven't met. For the moment, we are happy to have the staff proceed as planned.

Sincerely,

David A. Ward
Chairman

Reference:
Memorandum dated March 24, 1992 from Eric S. Beckjord, Office of Nuclear Regulatory Research, NRC, for Raymond F. Fraley, ACRS, Subject: PRA Working Group Program Plan