



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

May 18, 1979

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MEMORANDUM FOR: Chairman Hendrie
Commissioner Gilinsky
Commissioner Kennedy
Commissioner Bradford
Commissioner Ahearne

FROM: *AK* Al Kenneke, Acting Director, OPE

SUBJECT: OPE COMMENTS ON NRC PROGRAMS FOR EMERGENCY RESPONSE
AND HUMAN FACTORS IN LIGHT OF TMI ACCIDENT

Earlier this week you asked us for our ideas on what else might need to be done in addition to what the staff is now doing in two areas, i.e., emergency planning and reactor operator licensing and training, in which the TMI accident has raised significant questions about NRC policies.

We have reviewed staff reports and memoranda and Commission directives to the staff and discussed the two areas with your offices and with the staff.* The results of our efforts -- a "first cut" in view of the time constraints -- are enclosed in two short reports (Enclosures 1 and 2). You will note that the scope of the reactor operator licensing and training report has been expanded to include human factors in general in nuclear power plants. Although the reactor operator occupies a "front seat" as far as safety is concerned, maintenance and management personnel can be of comparable importance to safe operation.

Common to both of the areas we have examined -- and involved in other areas, e.g., review and evaluation of operating experience -- is the question how NRC staff should be organized to better integrate the related functions of the program offices. You may wish to consider establishing a few standing advisory committees of senior technical people to deal with cross-cutting issues. I believe some such organizational arrangement should be considered to deal with the emergency planning and preparedness program where several offices (HRR, IE, SD, SP) are involved and better integration is necessary. Each member of a standing committee would be selected, not only on the basis of professional competence and experience (as well as association in a program office with work related to

* We have just received from Roger Mattson a summary of the NRR activities on reactor operator licensing and training (Enclosure 3).

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the standing committee's purview), but also on the basis of ability to contribute to an integrated approach.

In each of the reports our perception of Commission policy objectives in the light of the TMI accident is stated and the ongoing staff activities examined; finally, based on our assessment of how well the Commission objectives are being met by the staff activities, we have identified important relevant issues and programs that may not be receiving the attention or priority they deserve. This sequence of analysis should provide a more integrated context for your further consideration of where we may go from here. We are continuing our efforts in examining these areas and if you have comments on what we have done so far or additional aspects you wish us to examine, please let me know.

Enclosures:
As Stated

cc: Leonard Bickwit
Sam Chilk
✓ Lee V. Gossick
Harold Denton
John Davis
Saul Levine
Bob Minogue
Roger Mattson
Robert Ryan

OPE COMMENTARY ON NRC PROGRAM FOR
EMERGENCY PLANNING AND PREPAREDNESSI. Policy Assumptions

- o NRC's activities in emergency planning will be upgraded, in terms of the Commission and staff's perceptions of the relative priority and importance of emergency planning and preparedness in light of the TMI experience, and the resources which NRC commits to this area.
- o A clearly defined organizational focus and structure will be developed within NRC which will highlight emergency planning as a significant staff activity and develop an integrated staff approach to the complex of related problems in this area.
- o The Commission will establish a clearer understanding than now exists of Federal, state, local and private sector responsibilities in emergency planning and preparedness, and improved modes of interaction among the several levels of government, the licensee, and the affected public.
- o Improved procedures will be developed for monitoring and collecting data on radiological releases; for coordinating such efforts and communicating with all interested public agencies (at each governmental level), the licensee and the public.
- o NRC's basic guidance documents in emergency planning and related programs including 10 CFR Part 50, Appendix E; Regulatory Guide 1.101; guide and checklist for state and local governments (NUREG-75/111) will be reviewed and reassessed.
- o The adequacy of concurred-in state emergency plans will be evaluated.
- o The Commission will take timely action on the recommendations of the GAO report and the NRC/EPA task force study (NUREG-0396).
- o The emergency planning and preparedness implications of NRC's siting policy will be reviewed and reassessed.

II. Ongoing Staff Actions

- o Response to GAO report on radiological emergencies. SP has drafted a response, circulated it for comments, and is preparing a paper for Commission action. EDO due date was May 4. The Commission response is due to Congress May 30.

Staff should be asked to forward the draft response to the Commission, with dissents attached, for immediate review as Commission policy.

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- o Regulatory approaches. In a draft response to question 54 to the staff of the Senate Subcommittee on Nuclear Regulation (5-4-79), NRC staff has promised to re-examine the need to incorporate in the regulations more specific requirements for licensee capabilities in an emergency situation, including: accident assessment with onsite instrumentation; communications requirements; offsite monitoring; and coordination with other Federal agencies.
- o NRC/EPA task force report (NUREG-0396). The public comment period ended on May 15, 1979. SP and NRR have promised to complete action and submit staff recommendations to Commission by July 1979.
- o NRC emergency planning guidance for state and local governments (NUREG-75/111).
SP expects to complete review and updating by December 1979.
- o NRC-state relations:
 - Eighteen letters have been sent to the Governors of each state with a nuclear power plant in operation (and to states contiguous to those with operating reactors) where NRC has not concurred in the states' emergency plans.
 - Federal Interagency Regional Advisory Committees have begun reviews of the Vermont and Pennsylvania state plans (reported in SP Weekly Report, April 27).
- o Additional Personnel. The EDO has assigned SP two additional person to work on emergency planning and has authorized six temporary positions at the Regional Office level to expedite review and approval of state emergency plans.
- o Communications:
 - NRC (IE) has requested licensees to notify NRC regional offices within an hour in the event of an uncontrolled transient and to maintain a continuous communications channel with NRC.
 - Staff has promised a response on means for expanding communications with states by July 1, 1979.
 - IE staff is presently working with AT&T to develop two telephone systems to connect each site with the NRC Operations Center and regional offices. The two systems would include: an operations line in each control room and a system for health physics communication.

In view of the slow pace of installation of telephone equipment the Chairman may wish to consider calling AT&T for assistance in accomplishing this.

o Improved Capabilities of State and Local Emergency Response Efforts

- SP has drafted a report, "Beyond Defense in Depth: Cost and Funding of State and local Government Radiological Emergency Response Plans and Preparedness in Support of Commercial Nuclear Power Stations", NUREG-0553, March 30, 1979, and has circulated it for staff comments. OPE has commented extensively on the report and has suggested revisions to improve the study.

- o Draft Manual Chapter on National Level Emergency Planning. MPA's Performance Appraisal Briefing (5-14-79) indicates that this is now in circulation and that comments from IE are still outstanding. The EDO has suggested deferral of this activity until 10-1-79.

III. Significant Outstanding Issues

Institutional Issues:

- o Coordination of emergency response activities at federal level. Pertinent issues to be addressed include:
 - Clarification of NRC's emergency response authority and responsibility for executing evacuation plans;
 - NRC's relationship to other federal agencies with emergency response responsibilities, including FEMA and IRAP;
 - Review and possible upgrading of IRAP responsibilities.
- o Clearly defined organizational focus within NRC. A mechanism is needed to provide emergency planning and preparedness activities with the attention it warrants, to develop an integrated staff approach to the many related issues, to develop and monitor contracts with outside consultants, as appropriate, and to coordinate relations with federal, state and regional offices.

Alternative options for achieving such a coordinating mechanism include:

- Formation of a task force composed of representatives of the affected staff offices, perhaps to report directly to EDO;
- Formation of a lead office with strengthened resources and staff to report to EDO or to the Commission;
- Formation of a group composed of non-NRC persons as well as staff;
- o Commission structure for providing leadership during an emergency. This might include consideration of:
 - Appropriateness of collegial structure for responding to emergencies;
 - Desirability of legislative changes.

- Clear definition of roles and responsibilities of NRC and state and local governments in radiological emergency response planning. Relevant issues to consider include:
 - Verification of capabilities of state and local governments to implement effectively their emergency plans, including the holding of drills and test exercises at the respective sites;
 - Desirability of legislative authorization for ensuring state and local conformance to federal standards of emergency planning;
 - Desirability of provision of funds to states and local governments to prepare and maintain their radiological emergency response plans.
- NRC relations to applicant. Pertinent questions include:
 - Should provision be made for a federal takeover of plant operations in similar circumstances to TMI?
 - Is NRC's existing authority adequate to require the licensee to follow a particular course of action in the event of an emergency?
 - Should NRC require licensee to provide adequate staffing during an emergency from outside sources (e.g. universities, utilities, consultants)?

Regulatory Issues:

- Monitoring, with attention to the following issues:
 - Clarification of responsibilities among federal agencies and applicant in collecting, recording and reporting on radiation data on a continuing basis in uniform ways. (Although NRC has authority, according to ELD, to engage in environmental monitoring to protect health and safety and to enforce its own regulations, the White House has assigned responsibility to EPA for coordinating and collecting the data for TMI.)
 - Purpose of environmental monitoring, including a clear notion of what is to be monitored;
 - Who is to perform the monitoring? What are respective roles of NRC, FEMA, EPA, IRAP, DOE?
 - Is state involvement appropriate?
 - Are federal-federal and/or federal-state interagency agreements desirable?

- Is better monitoring equipment needed to measure intermediate radiological releases?
 - Are additional resources and time needed to equip each NRC regional office with mobile radiation monitoring units (memo from Commissioner Kennedy 4/20/79)?
 - Are improvements needed in NRC's or applicant's capabilities for monitoring accidental releases offsite, and notifying affected state and local officials?
 - Should identification be made of plants which need to upgrade their monitoring systems for intermediate level releases (promised to Moffett Subcommittee, 5/14/79)?
- Communications, with attention to the following issues:
- Identification of respective responsibilities of NRC, related federal agencies, the affected state or states, and the applicant, in the event of an accident;
 - Actions to improve communication capabilities between licensees and NRC regarding unusual events at operating nuclear facilities. Commissioner Kennedy has requested a plan of action within 10 days (from May 4).
 - Actions needed to improve communications among NRC personnel at site; between NRC and DOE; among NRC and federal, state, and local authorities; among the Commission, the site and the Incident Response Center; and between the affected site and regional headquarters, in the case of unusual events. Commissioner Kennedy requested a report on short term action (4/23/79).
 - Review of information to public concerning adequate levels of protection, status reports and evacuation procedures in the event of an emergency. (This was promised to Moffett Subcommittee 5/14/79.)
 - Should establishment of emergency regional response capability be required as a condition of licensing?
 - Should applicant be required to make appropriate communication arrangements with state and local officials for designated distances around site?
 - Should a single official spokesman be designated to provide definitive information to the affected public concerning the emergency and provide status reports?
- Notification - Review of present requirements for NRC and state and local authorities including attention to such issues as:
- Placement of offsite detectors with readouts in local Civil Defense (CD) offices and State Health Departments; and
 - Establishment of meteorological data and readout capability in local CD offices, State Health Departments and off-site control center.

- Reassessment of regulatory requirements, with particular attention to the following:
 - Title 10 CFR, Part 50, Appendix E, "Emergency Plans for Production and Utilization Facilities":
 - NRC Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants";
 - If CDO recommendations should be adopted, further changes should be undertaken.
- Adequacy of concurred - in state emergency response plans with attention to the following issues:
 - Should concurred in plans be site-specific, perhaps with a separate attachment for each facility?
 - Should affected local governments be more heavily involved in the formulation and implementation of state plans?
 - Should NRC require states and licensees to designate a lead agency in cases of emergencies?
 - Should state plans contain clearly articulated goals with respect to the levels of protection to be achieved within different zones within specified time periods?
 - Revision of state plans to include recommendations of NRC/EPA task force report.

N.B. Representative Moffett stated at the House Subcommittee hearing that he has requested a GAO inquiry into the adequacy of states' emergency plans.
- Reassessment of NRC's siting policy with particular reference to:
 - The siting of reactors in heavily populated areas;
 - The size of LPZ's;
 - Evacuation and justification of siting criteria;
 - Consideration of Class 9 accidents in the licensing process.

ENCLOSURE 2

OPE COMMENTARY ON NRC PROGRAM FOR
CONSIDERING HUMAN FACTORS, IN LIGHT OF THE TMI ACCIDENT

I. Policy Assumptions

- o Organizational arrangements will be implemented to provide a focal point and resources necessary for expeditious NRC-wide examination of human factors and their impact on safety in order to improve assurance that plant personnel will function decisively and effectively in transient and accident mitigation.
- o The number and qualification of station control and critical maintenance personnel will be augmented to assure that operators' attention to the NMSS and safety-related systems is unimpaired.
- o Training needs for station control and critical maintenance personnel will be clarified and, where necessary, upgraded.
- o Eligibility and requalification programs for the licensing of operators -- particularly PWR operators -- will be re-examined in terms of both short and long-term needs.
- o The quality of operating procedures -- together with assurances that they are carried out properly -- will be upgraded.
- o Requirements for control room equipment configurations will be upgraded to reduce potential operator error through efficient man-machine interfaces.
- o The capability for direct communication of appropriate control room information to the NRC incident response center in the event of an accident will be provided.

II. Ongoing Staff Actions

- o Staff is responding to Commission request of April 30 for information concerning the qualification of reactor operators. Of 7 tasks, 2 have been completed (superintendents and legal/labor/management aspects), three are now expected May 25 (simulators, nuclear Navy operators and statistical profile of operating experience education and salary), two are now due June 1 (requalification results), and one is scheduled for June 15 (licensee training and testing).
- o In the staff report on the generic assessment of feedwater transients in B&W PWR's (NUREG-0560) dated May 1979, a 9-page section on operator training and actions provides a synopsis of relevant follow-up staff actions and recommendations.

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- o Draft GAO letter report to Senator Schweiker -- NRC staff comments were provided orally to GAO staff on May 14, 1979. The letter report includes an extensive series of questions on human/operator error and NRC requirements and practices.
- o Lee Gossick's memo of May 16, 1979 to Harold Denton on evaluating the operator licensing program in light of TMI and the above GAO letter report -- for both the near-term and a longer term.

We believe today's memorandum from Roger Mattson to OPE (Enclosure 3) best summarizes all ongoing staff action relevant to operator licensing and training in general, and to the above four documents, in particular.

II. Significant Outstanding Issues

- o In calling for a complete re-evaluation of NRC's program for licensing nuclear power plant operators, the GAO letter report has raised an extensive series of specific questions. The report states that NRC and the recently appointed Presidential Commission should give attention to those questions. However, GAO does caution that any emphasis on human error should not eclipse the potential for design and other generic weaknesses. (Note that GAO considered human/operator error at both TMI and other nuclear power plants.)
- o As reflected by Roger Mattson's memorandum of May 18, a large fraction of relevant NRC staff has been busy responding to Commission instructions, GAO inquiries, and EDO initiatives concerning human factors -- to the extent that NRR's Operator Licensing Branch had to suspend operator license examinations on April 9. Significant activities described by Mattson appear to cover -- to some level of specificity -- all issues that have so far surfaced in this area. NRC now appears to be at a point in a development process, where most decisions must await more comprehensive formation that is being gathered and disseminated by the staff -- internally and from other organizations.
- o Many potential upgrade areas, e.g., simulator training and operator qualification and requalification, should be closely supported by available help from other agencies with relevant expertise, e.g., NASA and the Navy.
- o Upgrades for training should include periodic simulator training under both normal and abnormal conditions -- after first determining both the function of such training and identifying appropriate types of simulators. Other mechanisms e.g., periodic drills with initiating transients during normal shutdowns, should also be explored. Along this line, alternative NRC requirements might be proposed for licensee preventive maintenance programs for safety-related equipment.
- o Upgrades for operating procedures should include a complete safety check list process to assure their actual achievement.
- o Upgrades for hardware should include on-line diagnostic capabilities, e.g., standardized control panel layouts and more reliable instrumentation for parameters critical to operator performance.

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MAY 18 1979

MEMORANDUM FOR Albert P. Kenneke, Acting Director
Office of Policy Evaluation

FROM Roger J. Mattson, Director
Division of Systems Safety, NRR

SUBJECT OPERATOR LICENSING AND TRAINING ACTIONS FOLLOWING
THE TMI-2 ACCIDENT

This memo provides a status report on current NRR activities relating to operator licensing and training subsequent to the TMI-2 accident.

For the last few weeks the NRR Operator Licensing Branch personnel have been heavily involved in direct support of NRR activities at TMI-2, in the IE team that visited each Westinghouse and Combustion Engineering plants to discuss the IE bulletins with licensed personnel, in the bulletin response review team, in the B&W plant restart review teams, and in the B&W generic small break LOCA analysis review team.

Because of these other higher priority activities for the OLB staff, operator license examinations were suspended on PWR reactor plants as of April 9, 1979. Resumption of examinations will occur upon completion of the PWR plant bulletin response, review of revisions of operating procedures at operating plants, and review of the training associated with the bulletin response.

The most significant assessment so far of the longer term implications of TMI-2 for operator licensing and training was that done in connection with Section 4 of NUREG-0560 (enclosed)*. Based upon this preliminary work certain recommendations have been made by the staff in Section 8 of NUREG-0560. Included is a recommendation for better operator training including better utilization of simulators to track events that 1) lead to the formation of voids; 2) lead to long term natural circulation cooling; and 3) include effects of equipment failure and plant system misalignment. The need to better develop more effective procedures to cope with transients and accidents is also recommended. In this regard, the procedures would address system type failure modes to give the operator more guidance to assist in decision making.

*Staff Report on the Generic Assessment of Feedwater Transients in Pressurized Water Reactors Designed by the Babcock & Wilcox Company.

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A significant consideration that comes from the TMI-2 accident is the need to provide operators with the capability to function in a more decisive and effective manner. That is, there should be better preparation of operators as effective agents in transient and accident mitigation. While training improvements will help, training alone will probably not provide the capability ultimately desirable. On-line diagnostic aids, such as computer based systems, might be an important factor in providing the operator with better ability to diagnose rapidly developing accident situations. These possibilities and the recommendations in NUREG-0560 will be evaluated by the NRR lessons learned task force and actions will be initiated on the higher priority, most promising areas when such evaluation has been completed, perhaps within the next month. In this context, it is important to note the draft report dated May 11, 1979 to Senator Richard Schweiker on NRC's operator licensing program that has been prepared by the GAO. The Office of Inspector and Audit is coordinating NRC's response to this report. Our Office will have the bulk of the input to answering the questions raised by GAO, but our work on this project is only now beginning, subject to the resource commitments to higher priority work, described above. The lessons learned task force will coordinate this effort with the plan for near term and long term actions in the operator training area.

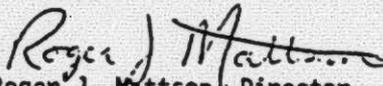
During the conduct of its investigation, the GAO representatives were advised by personnel in the Office of Nuclear Regulatory Research of two studies sponsored by the Probabilistic Assessment Branch of RES. One study, contracted to the Iowa State University, involves use of probabilistic analysis methods to evaluate licensee event reports that involved human error. The second study, contracted to Sandia Labs, involves use of probabilistic analysis in human factors analysis. It is possible that results from either of these studies may lead to consideration of changes in operator training and licensing requirements just as they may lead to considerations of changes in system design, control systems, testing or procedural requirements.

To summarize, there are several significant activities presently underway relating to operator training and licensing that involve a large fraction of NRC's expertise in this area. The activities are as follows:

1. All licensed personnel from B&W plants are undergoing training on the B&W simulator on the TMI-2 accident sequence. Included in the training are:
 - a. Simulation of the response of instruments during the TMI-2 accident.
 - b. Training on loss of off-site AC power with accompanying natural circulation.
 - c. Recovery of pressurizer pressure and level following saturation in the reactor coolant loops.
 - d. Review of actions required by the IE Bulletins concerning TMI-2.

2. All PWR licensed personnel have completed training required in IE Bulletin 79-06A and 79-06B, Review of Operational Errors and System Misalignments Identified During the Three Mile Island Incident, dated April 14 and 18, 1979, which included:
 - a. Understanding the seriousness of blocking auxiliary feedwater trains, apparent operational errors and analysis of the TMI-2 accident.
 - b. Instruction not to override automatic actions of engineered safety features.
 - c. Review of operator actions and revised procedures to assure, for accident conditions, that there exist core flow and a heat sink with sufficient coolant inventory and that the primary and secondary systems are intact.
3. A meeting was held in Bethesda, April 13, 1979, with managers of the simulator training centers, simulator vendors, and representatives of consultant firms to discuss simulator training and the TMI-2 accident. The training center personnel were instructed to develop the following capabilities for reactor simulators:
 - a. Modelling saturation conditions in primary loops to provide training on how to avoid and how to regain pressure and level in pressurizers in the event of saturation in the loops.
 - b. Training to include an operating review of the safety systems and central parameters following re-initialization of the simulator during training exercises.
 - c. Providing multiple failure accident training, including incorrect instrument responses.
 - d. Providing training for both active and passive failure of Engineered Safety Feature Components.
 - e. Providing training on natural circulation operation under solid water conditions.
4. Preparation of the response to a memorandum from Samuel J. Chilk to Lee V. Gossick, Commission Briefing on Procedures for Qualifying Reactor Operators, dated April 30, 1979, which included the following:
 - a. Investigation of simulator use under accident conditions in FAA, NASA and commercial airlines.
 - b. A statistical profile of the licensed operator and senior operator based on experience, age and salary as compared to the profiles in other regulated industries such as air traffic controllers and commercial airline pilots.
 - c. A determination of the number of nuclear plant superintendents and assistant superintendents who have held licenses or who currently are licensed by the NRC.

- d. Providing information on facility requalifications examinations and retraining. This information is being supplied by IE.
- e. A review of the Navy nuclear training and examination program and a comparison to the NRC program.


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~~Enclosure:
Excerpt from Sections 4
and 8 of NUREG-0560~~

(OPE NOTE: Enclosure deleted)

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