



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

PDR

JUL 13 1980

MEMORANDUM FOR: Harold R. Denton, Director, Office of Nuclear Reactor Regulation

FROM: Stephen H. Hanauer, Director, Division of Human Factors Safety, NRR

SUBJECT: REQUEST FROM PRESIDENTIAL NUCLEAR OVERSIGHT COMMITTEE CONCERNING IMPROVEMENTS IN OPERATOR QUALIFICATION AND TRAINING.

## I. INTRODUCTION

Our efforts to improve licensed operator and senior operator performance can be grouped into three chronological phases; immediate, near term, and long term. Our immediate actions were directed toward operator understanding of the TMI-2 accident and the related procedural and facility changes. Improvements made in this phase were primarily implemented through Bulletins and Orders issued by the Commission and through some of the recommendations of SECY-330E, "Qualifications of Reactor Operators" which was adopted by the Commission. The immediate actions are discussed in Appendix A.

Our near term actions implemented the remaining recommendations of SECY-330E by the March 28, 1980 letter from H. R. Denton to all power reactor applicants and licensees. Although included in the TMI-2 Action Plan, this letter set forth an implementation schedule for the accepted recommendations.

Long term actions include revisions to regulations, regulatory guides, and ANS Standards. In addition, contracted studies were initiated to formulate long term criteria for operator qualification and licensing.

## II. DISCUSSION

### A. Near Term Improvements.

The near term actions regarding licensed operator improvements were initiated March 28, 1980, in the letter to all power reactor applicants and licensees. Revised criteria on the qualifications, training, licensing, and requalification of reactor operators were issued. Enclosure 1 details these revised criteria and the required implementation dates; however, a brief comparison to previous criteria is presented below.

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1. Qualifications

In the area of operator qualifications, we have modified the experience criteria to now require that all applicants for an operator license spend at least three months as the extra person in the control room. In addition, applicants for a senior operator license must hold an operator's license for one year and spend three months as an extra man on shift.

2. Training

Improvements in the training of operators have been made by requiring training programs to include the topics of heat transfer, fluid flow and thermodynamics. In addition, augmented training in the control and mitigation of reactor transients and accidents is required. Finally, training instructors will now be required to demonstrate their competence to the NRC by successful completion of a senior operator examination.

3. Licensing

To upgrade the operator licensing process, we have expanded the NRC reactor operator and senior operator written examinations to include a category in each covering heat transfer, fluid flow and thermodynamics. In addition, the passing grade has been increased from 70% overall to 80% overall, with each category grade (there are eight reactor operator and six senior operator categories) required to be greater than 70%. The new criteria has been in effect since May 1, 1980.

During May and June, 60 operator and 30 senior operator examinations were administered and graded. The failure rate for operators was 30% and for senior operators 17%. This compares to a January 1977 - March 1979 failure rate of 5.7% for operators and 4.1% for senior operators.

4. Requalification

We have also required changes to the facility operator requalification programs. Henceforth, these programs shall include instruction in the areas covered by the new examination categories and shall require review of specific reactor operations and/or transients. The passing grade for the annual requalification examination will be increased to reflect the new NRC initial examination criteria.

### III. LONG TERM IMPROVEMENTS

In our long term efforts to improve operator performance, we have initiated a program to reassess the requirements regarding selection, training, and licensing of all categories of personnel involved in the operation and maintenance of nuclear power plants. As part of this program, we have contracted Analysis and Technology, Inc. of North Stonington, Conn. to provide an independent perspective regarding the requirements for operator licensing. In addition, another study was performed to analyze power plant staffing and has been published as NUREG/CR-1280. The latter document compared Navy requirements regarding education, experience and training for all responsible positions to those of the industry and NRC for similar positions. This document was distributed for public comment. We intend to consider the results of these studies in the future changes to the operator licensing process and the qualifications of all personnel at nuclear power plants.

To further enhance reactor operator training programs, we have formed an Accreditation Committee to establish criteria for acceptance training staffs and program content. Furthermore, several regulatory guides and ANS standards have been revised to incorporate the findings of the TMI-2 investigative efforts. ANS 3.1, "Standard for Qualification and Training of Personnel for Nuclear Power Plants" was revised on December 6, 1979. Although draft, ANS 3.1 has not yet been approved as an American National Standard; Regulatory Guide 1.8, Revision 2, is being developed in parallel with and endorses the Standard such that comments on each can be resolved in an expeditious manner.

The ANS 3 committee has also revised ANS 3.5, "Nuclear Power Plant Simulators for Use in Operator Training". A Regulatory Guide endorsing the Standard is presently under review within the NRC. Other improvements which are being considered for implementation in the future are identified in the March 28, 1980 letter. These include mandatory simulator training and retraining and NRC administration of requalification examinations.

Presently, there are fifteen nuclear power plant simulators in operation and fourteen on order. In addition, it has come to our attention that every other utility was making an engineering evaluation or evaluating bids regarding simulators.

### IV. SUMMARY

In the preceding paragraphs we presented in chronological order, the efforts that have been undertaken to improve the qualifications and training of licensed personnel. As the Commissioners indicated in their comments concerning SECY-330E, these efforts should not be considered as all inclusive but rather as the first step in further

enhancing the capabilities of licensed personnel to safely operate nuclear power plants. Continued improvements will be made as warranted in light of the ongoing study efforts and from operational transient analysis. Inputs from and coordination with the NRC's Office for Analysis and Evaluation of Operational Data and the industry's Institute for Nuclear Power Operations will be extremely valuable in this continuing effort.

*for* *Van A. Moore*  
Stephen H. Hanauer, Director  
Division of Human Factors Safety

Enclosures:

1. Appendix A
2. Ltr dtd 3/28/80 from HR Denton.

cc: w/enclosure  
E. G. Case

## APPENDIX A

### IMMEDIATE ACTIONS

This phase of our efforts began immediately after the TMI-2 accident and extended approximately to the issuance of the March 28, 1980 letter.

#### I. Bulletins and Orders Requirements

Three sets of I&E Bulletins were issued to all operating utilities; 79-05 series to B&W designed reactors, 79-06 series to Westinghouse and Combustion Engineering and 79-08 to General Electric. The principle thrust of these Bulletins, with respect to operator training, was to ensure all operators were aware of the TMI-2 accident causes and effects, to set forth minimum requirements for termination of high pressure injection, and for PWR's, to emphasize the importance of maintaining the steam generators as a heat sink with auxiliary feedwater.

Commission Orders were also sent to all operating B&W plants. Many procedural and design changes were implemented as a result of the Orders. Those primarily affecting operating personnel were turbine trip-reactor trip circuitry, auxiliary feedwater procedures and small break loss-of-coolant procedures. Also, all licensed personnel were required to attend a TMI-2 training session at the B&W simulator.

NRC audits of the licensed personnel were conducted at each of the B&W plants prior to allowing restart of the facilities. In most cases, the NRC determined that additional training was required. This training was conducted by contracted consultants following which re-audits were performed by the NRC.

All licensed personnel at B&W plants were also required to pass a facility administered written examination concerning the topics listed in the Orders. These examinations had a passing grade of 90% and were audited for content and grading by the NRC.

As a result of the long term requirements of the Orders, each facility was to continue operator training and drilling on small break LOCA response in addition to under and over-cooling transients. Also training and requalification programs were modified to incorporate lectures and instruction on all of the above topics.

Small break LOCA guidelines were developed by each of the other NSSS vendors and implemented as procedures at the operating plants. Selected audits of operators at Westinghouse, Combustion Engineering, and General Electric facilities were conducted by the NRC in December 1979.

The need to trip the reactor coolant pumps for some small break LOCA's was identified in June, 1979 and Bulletins 79-05C and 79-06C were issued to insure training programs and procedures were modified to include this requirement. The Bulletins further stipulated that two licensed operators were to be stationed in the control room at each PWR during operation to ensure that the pumps were tripped in a timely manner should it become necessary.

The B&O Task Force also identified two areas of operator training that coincided with the findings of other post-TMI-2 investigative efforts. One was the operators knowledge of thermodynamics, heat transfer, and fluid flow. A previous recommendation had been adopted by the Commissioners to develop a new category on both the operator and senior operator written examinations that included these subjects.

In our second finding, the quality of simulator response to transients was found deficient in some areas. The TMI-2 Action Plan includes several recommendations on improved use and development of training simulators.

## II. NTOL PLANTS

The implementation of improvements in operator training requirements and qualifications on NTOL plants was in two primary areas; Lessons Learned recommendations and examination standards.

The Short Term Lessons Learned recommendations for this discussion are more properly classified as improvements in operations, operations support and in-plant emergency response. The six recommendations implemented on the NTOL plants include:

1. Shift Supervisor responsibilities
2. Shift Technical Advisor
3. Shift and Relief Turnover Procedures
4. Control Room Access
5. Onsite Technical Support Center
6. Onsite Operational Support Center

Although all plants will ultimately incorporate these recommendations, their implementation schedule was expedited on the NTOL plants.

Increased examination standards were imposed on the following NTOL plants: Sequoyah 1, North Anna 2, Salem 2, and McGuire 1. Applicants taking the written examinations were required to achieve an overall grade of 80% and at least 70% on every category. These examinations were administered prior to May 1, 1980, after which time the increased passing grades became a requirement for applicants at all nuclear power plant facilities.

In addition, applicants holding current licenses on Salem 1 and North Anna 1 were required to take complete NRC examinations for the second unit at the respective sites. The previous procedure for obtaining a license on the second unit coming on-line was to successfully complete a facility administered lecture series and examination on the differences between the two units. These examinations were audited by the NRC.

The new categories relating to thermodynamics, heat transfer and fluid flow were not contained in the written examinations administered at the NTOL plants although increased emphasis was placed on these subjects in existing categories. The new categories have been in effect since May 1, 1980.

In addition to the NTOL plants, applicants for licenses at Indian Point, Zion, and Rancho Seco were subject to the increased grade criteria on the written examination prior to the May 1, 1980 implementation date. These criteria were imposed for these cases since the issue of operator competency was raised in litigation proceedings.

### III. Miscellaneous Items

In addition to those activities described in paragraphs A and B, various other improvements were taking place in operator qualification and licensing. Applicants for senior operator licenses who already held valid reactor operator licenses were required to take an oral examination along with a written examination. Previously, the oral examination was waived. Increased emphasis on this oral evaluation, was placed on the senior operators responsibilities for directing the response of the plant crew during accident and transient situations.

As a result of the Crystal River incident of February 26, 1980, a recommendation was made in NUREG-0667, "Transient Response of Babcock & Wilcox Designed Reactors" that all licensed personnel at B&W facilities participate annually in a one-week simulator requalification program. We envisioned that this recommendation be extended for licensees at all power plants in the longer term.