UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289 SP
	)	(Restart Remand on
	)	Management - Training)
(Three Mile Island Nuclear	)	
Station, Unit No. 1)	)	

LICENSEE'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW ON THE ISSUE OF LICENSED OPERATOR TRAINING AT TMI-1

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I. Introduction and Background

A. The Remand on Training

1. In May, 1984, the Appeal Board remanded this proceeding to the Licensing Board for further hearings on three discrete management-related issues. Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1), ALAB-772, 19 N.R.C. 1193 (1984). This partial initial decision addresses the remanded issue of licensed operator training at Three Mile Island, Unit 1 ("TMI-1").

2. In 1979, the Commission ordered TMI-1 to remain shut down pending a hearing on a number of issues, including the

management capability and technical resources of the Licensee.1/ CLI-79-8, 10 N.R.C. 141, 143 (1979); see also CLI-80-5, 11 N.R.C. 408 (1980). After an extensive hearing on management issues, including the substantive adequacy of the TMI-1 licensed operator training program, the Licensing Board issued a decision in August 1981 favorable to Licensee. LBP-81-32, 14 N.R.C. 381 (1981). Because of the contemporaneous discovery of cheating on NRC licensed operator examinations, however, the Board retained jurisdiction of the case to consider the impact of this new information on its findings and conclusions on Licensee's management competence. Id. at 403 (¶ 45). The Board subsequently reopened the management proceeding and appointed a Special Master to hear evidence on the impact of the cheating incidents at TMI-1. Further hearings were conducted, culminating in a recommended decision by the Special Master and a partial initial decision by the Licensing Board. See LBP-82-34B, 15 N.R.C. 918 (1982); LBP-82-56, 16 N.R.C. 281 (1982). The Licensing Board decision found there to have been a breakdown in the integrity of Licensee's training and testing

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1/ In 1981, the operating license for TMI-1 was transferred from Metropolitan Edison Company to the newly formed General Public Utilities subsidiary, GPU Nuclear Corporation. CLI-81-17, 14 N.R.C. 299 (1981). At the same time, the Commission instructed the Licensing Board to consider the management competence of GPU Nuclear, rather than that of Metropolitan Edison, the original TMI-1 licensee. Id.

program at TMI-1. LBP-82-56, supra, 16 N.R.C. at 300 (¶ 2082). The Board imposed several conditions on restart directed at obtaining future assurance of the adequacy of the training program. Id. at 365, 384 (¶¶ 2347, 2420). The Board also concluded, however, that the identified weaknesses in the program did not undermine the Board's earlier decision favoring restart. Id. at 301 (¶ 2089).

3. In ALAB-772, the Appeal Board reviewed the entire record in the TMI-1 restart proceeding on the ability of GPU Nuclear Corporation's management to safely operate TMI-1. ALAB-772, supra, 19 N.R.C. at 1201. The Appeal Board endorsed the Licensing Board's characterization of the question which had to be answered following the cheating incidents at TMI-1, viz., "is the instruction adequate to prepare the operators to operate the plant safely?" Id. at 1232, citing LBP-82-56, supra, 16 N.R.C. at 363 (¶ 2343). The Appeal Board disagreed with the Board, however, that this question could be satisfactorily resolved from the existent record. ALAB-772, supra, 19 N.R.C. at 1232-33. In the Appeal Board's mind, the record in the reopened proceeding perhaps had raised more questions than it satisfactorily had answered. Id. at 1233.

4. In particular, the Appeal Board was concerned about the fact that in the reopened proceeding, the Licensing Board

had not heard additional testimony from the panel of experts upon whom the Board had heavily relied in the first instance in approving the TMI-1 training programs. In 1980-81, these experts, known as the OARP Review Committee,2/ had reviewed Licensee's training program and, while recommendations for improvement were made, the experts strongly endorsed the program. See ALAB-772 at 1210-11. In view of the significance of the testimony of the OARP Review Committee to the initial management decision, the Appeal Board found the absence of further testimony from these experts during the reopened hearings on cheating to constitute "a significant gap in the record." Id. at 1234, 1237. Accordingly, the Appeal Board remanded the issue of the adequacy of the TMI-1 licensed operator training program in order to obtain the views of the OARP Review Committee on this subject, given the occurrence of cheating at TMI since the experts' earlier favorable testimony.

2/ The OARP Review Committee was a select Committee made up of experts in the fields of educational psychology (Dr. Eric Gardner), engineering/human factors psychology (Dr. Julien M. Christensen), nuclear engineering education (Dr. William R. Kimel), nuclear power generation (Dr. Robert E. Uhrig), and nuclear power plant operator training (Mr. Richard J. Marzec). The OARP Review Committee issued a Report in 1980 that reviewed the Operator Accelerated Retraining Program ("OARP") conducted at TMI in 1979-1980. The OARP was a one-time intensive program designed to significantly improve licensed operator performance. See LBP-81-32, supra, 14 N.R.C. at 451-53 (¶¶ 196-201).

5. The Appeal Board summarized its holding as follows:

> The most significant issue requiring further hearing is training. Because the safe operation of the plant is so heavily dependent upon the operators' skill, the importance of training cannot be overstated. The cheating and related incidents called into question the adequacy and integrity of licensee's entire training and testing program. Although we have found that the reopened record on the cheating itself was as fully developed as possible, the impact of those findings on the Licensing Board's earlier conclusions on licensee's training program was not given the full consideration it warrants. In particular, the Board should have sought further testimony, in light of the cheating incidents, from the OARP Review Committee, whose views the Board previously found so persuasive.

ALAB-772, supra, 19 N.R.C. at 1279. In short, the Appeal Board concluded that it was necessary to reopen the record on Licensee's management competence to determine whether the OARP Review Committee continued to endorse the TMI-1 licensed operator training program.

B. Participants in the Proceeding

6. On June 28, 1984, the Licensing Board presided over a prehearing conference among the parties for the purpose of defining the issues and providing for prehearing procedures in the proceeding remanded by the Appeal Board in ALAB-772. At that conference, in addition to Licensee and the NRC Staff, the Commonwealth of Pennsylvania ("the Commonwealth"), Three Mile

Island Alert ("TMIA") and the Union of Concerned Scientists ("UCS") were parties to the restart proceeding that expressed an interest in participating in the remand on training. Tr. 27,281 (Commonwealth); 27,280 (TMIA); 27,280-81 (UCS).3/ A schedule was set for discovery and the commencement of the evidentiary hearings. See Memorandum and Order Following Prehearing Conference, July 9, 1984. Extensive discovery was pursued by the parties from July through November, 1984.4/ The evidentiary hearing began on December 19, 1984 and continued intermittently for 11 days, closing on January 18, 1985.

7. The Board encouraged and the intervenors agreed to utilize lead intervenors in the remanded proceeding. Tr. 27,294 (Chairman Smith, Jordan); Memorandum and Order on Lead Intervenors, July 13, 1984. This arrangement was made with the understanding that no intervenor waived its right to pursue its separate interests where the lead intervenor did not fully

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3/ The Aamodt Family, who had been active in the prior litigation of training, opted not to participate in this remand on licensed operator training. See Tr. 27,280, 27,292A-93 (Ms. Aamodt).

4/ Licensee estimated that it produced over 60,000 pages of training-related documents in response to one set of discovery requests from TMIA and seven such requests from UCS. In addition, most of the witnesses were deposed, along with UCS-specified TMI-1 operators who participate in the training program, several other GPU Nuclear personnel, and several NRC Region I inspectors. See Tr. 31,740-41 (Bauser).

represent the others. However, intervenors were required to make good faith efforts to consolidate their case with the presentation of the lead intervenor before proceeding independently. If these efforts failed, the intervenor could then seek leave of the Board to proceed separately. See Board Memorandum & Order on Lead Intervenors, July 13, 1984; see generally 10 C.F.R. § 2.714(e) and Part 2, App. A, § III(a)(4). Of course, the benefit of such consolidation, from the intervenor's standpoint, was that the lead intervenor bore the brunt of the discovery burden and other responsibilities of participation. See Tr. 27,302 (Chairman Smith). In the remand on training, one of these responsibilities was to designate, on the date that prefiled testimony was due, exhibits a party intended to use in support of its case-in-chief. Memorandum and Order (Requiring Identification of Proposed Exhibits), October 24, 1984.

8. The intervenors identified the subject areas that they were interested in pursuing within the rubric of training by specifying issues of interest to them. UCS identified two issues, which were modified and approved by the Board. These issues related to the substantive adequacy of training to prepare operators to operate TMI-1 safely. Memorandum and Order on Lead Intervenors, July 13, 1984 at 3; Memorandum and Order on Licensee's July 31, 1984 Comments on Lead Intervenors and Motion to Partially Exclude UCS From Management Phase, August

30, 1984 at 3-4; see also Tr. 31,736, 31,757 (Chairman Smith).5/ TMIA specified four subissues of interest to it.6/

5/ UCS' proposed subissues were:

> (1) Are the operators equipped to safely operate the plant particularly in emergency situations?
>
> (2) Do the NRC and Company examinations reliably measure the operators' ability to safely operate the plant?

Memorandum and Order on Lead Intervenors, July 13, 1984 at 2.

After further comments were submitted by the parties on the scope of the proceeding, UCS subissue (1) was modified as follows:

> (1) Are the operators trained to safely operate the plant in accordance with approved procedures, particularly in emergencies?

Memorandum and Order on Licensee's July 31, 1984 Comments on Lead Intervenors and Motion to Partially Exclude UCS from Management Phase, August 30, 1984, at 3. In addition, the Board reemphasized the fact that the NRC examinations were appropriately within the scope of UCS subissue (2) only to the extent the OARP Review Committee relied upon these exams as a measure of operator competence. During discovery, in response to a Board inquiry precipitated by a discovery dispute between UCS and the NRC Staff, the Committee made clear that its opinions about Licensee's training program were formed independently of the NRC examinations. See letter from Licensee's counsel to the Licensing Board dated September 27, 1984; see also Tr. 31,966-69 (Kimel, Gardner, Kelly, Christensen, Uhrig); Tr. 32,085-87 (Kelly). Accordingly, the NRC exams were not within the scope of the remanded proceeding.

6/ TMIA sought lead intervenor status to pursue the following issues:

> (1) Has GPU properly responded to the

(Continued Next Page)

Because the wording of TMIA's proposal suggested that TMIA might pursue matters that were res judicata, the Board simply approved TMIA's lead on the training issue to the extent that ALAB-772 authorized an inquiry into cheating and integrity as they relate to training. Memorandum Order on Lead Intervenors, supra, at 3; see also Tr. 31,757-58, 31,784-85 (Chairman Smith).

9. During the course of the proceeding, it was apparent and, indeed, TMIA acknowledged that it had not made an effort

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(Continued)

> problems in its training program identified internally and/or by the Special Master, the Licensing Board and the Appeal Board?
>
> (2) Are the people responsible for the management and implementation of the training program properly equipped by their own experience and attitude to impart the information and values necessary for safe operation of TMI-1?
>
> (3) Do the operators have the appropriate attitude toward the training program; do they believe it is effective?
>
> (4) How does the history of GPU's problems with training and its current training program reflect on the competence and integrity of GPU management?

Memorandum and Order on Lead Intervenors, July 13, 1984 at 2. In its August 30, 1984 Memorandum and Order, the Board ruled that TMIA subissue (4) was outside the scope of the remanded proceeding.

to consolidate its presentation with that of UCS. See Tr. 31,996 (Bradford); see, e.g., Tr. 32,639-50 (discussion among parties, Board). In its discretion, the Board nevertheless allowed TMIA to pursue on cross-examination its areas of interest, which were the issues of integrity and attitude, and as well to offer as exhibits documents in these subject-areas, notwithstanding TMIA's failure to provide advance notice to the parties of these exhibits. See, e.g., 32,239-80 (TMIA Training Exhs. 3A-3M). Although this latitude was permitted, the Board advised TMIA that TMIA was wholly in default of the Board's procedural rulings and was not entitled to surprise the other parties by, for the first time at trial, identifying its affirmative case. See Tr. 31,986, 32,311-13, 32,249-51 (Chairman Smith, Judge Wolfe).7/

7/ The Board cited a number of reasons for this finding: (1) TMIA had failed to comply with the Board's orders to review and identify case-in-chief documents in advance; (2) TMIA apparently had not engaged in the type of discovery necessary to effectively cross-examine the witnesses, instead choosing to use the hearing process as a discovery mechanism; (3) TMIA's experienced trial counsel in the case elected not to participate in the remand on training; and (4) frustrating the purposes behind the administrative procedure agreed upon by all parties, TMIA had failed to comply with the Board's order to utilize a lead intervenor system. Tr. 32,311-13 (Chairman Smith); Tr. 32,645-50 (Chairman Smith); see Tr. 32,236 (Bradford).

C. The Scope of the Proceeding

10. The focus of the Appeal Board's remand of training is on the views of the OARP Review Committee. However, in Section III.C of ALAB-772, the Appeal Board raises numerous questions about Licensee's training program. Because of the importance of the issue of training, see ALAB-772, supra, 19 N.R.C. at 1279, and our independent responsibility to ensure that the record in this proceeding is complete,8/ the Board was reluctant to interpret narrowly the Appeal Board's directive remanding the issue of training. Moreover, while the Appeal Board may have remanded the training issue solely to hear the views of Licensee's consultants, the right of other parties to confront those views necessarily broadened the scope of the hearing. See Memorandum & Order Following Prehearing Conference, July 9, 1984 at 3. However, ALAB-772 specified several limitations on the scope of this proceeding and, by applying those limitations, the Board essentially provided a framework within which the evidentiary proceeding ensued.

8/ In ALAB-772, the Appeal Board made clear that the remand was precipitated by "the Licensing Board's failure to reconsider, as promised and in a meaningful way, its earlier finding that licensee's training program was 'comprehensive and acceptable.'" ALAB-772, supra, 19 N.R.C. at 1233. In this remanded proceeding, the Board therefore is charged with a particular responsibility to ensure an extremely thorough record, independent of the like responsibilities conferred on it by the Commission in its original institution of this proceeding. See CLI-79-8, 10 N.R.C. 141, 147-49 (1979).

11. The broad issue on remand was the adequacy of the training program to prepare the TMI-1 licensed operators to operate the plant safely. See Board Memorandum & Order Following Prehearing Conference, July 9, 1984 at 2-3; see, e.g., Tr. 32,270-74 (Chairman Smith). However, this broad issue was confined by the Appeal Board in Section III.C of ALAB-772 to the implications of cheating and other deficiencies which came to light in the reopened proceeding on cheating. In addition, management findings (including findings on the TMI-1 training program) which were not placed in issue by the Appeal Board were res judicata in the remanded proceeding. Id. at 3. For example, the remand did not permit the relitigation of the cheating incidents themselves. Id. at 3, 6.

12. Another significant element of the definition of the scope of the remanded proceeding was that it addressed the adequacy of licensed operator training at TMI-1. Section III.C. of ALAB-772 addresses only licensed operator training. Furthermore, the cheating that precipitated this remand was limited to cheating on licensed operator examinations and quizzes. See ALAB-772, supra, 19 N.R.C. at 1212-32. In short, the record on training for non-licensed personnel is res judicata and was not relitigated.

13. In addition, ALAB-772 clearly remanded the issue of training in order for the Board to assess the implications of the cheating incidents on the adequacy of the operator training program currently in existence at TMI-1. ALAB-772, supra, 19 N.R.C. at 1235; see generally id. at 1232-37 (issue is whether past deficiencies "still exist," and current status of program and personnel.) However, the Board was reluctant to deny parties the right to pursue a particular past problem insofar as that problem could shed some light on the adequacy of the current program. See ALAB-774, 19 N.R.C. 1350, 1356 (1984) ("This proceeding was not instituted to provide a forum in which to litigate directly all possible errors of the past; past training deficiencies are part of the reopened proceeding only insofar as they shed 'new light on the adequacy of licensee's existing training program.'"); see, e.g., Tr. 32,220-31 (TMIA cross-examination of Dr. Long about 1979 timeframe).

14. Finally, the Board permitted litigation of the NRC license examination only insofar as this process formed a basis for the OARP Review Committee's opinion of Licensee's program. See n.5, supra. In its review, the Committee did not rely at all on the NRC exam. Id. Consequently, the NRC exam was not at issue.

15. Not surprisingly, the parties' interpretation of the scope of the remanded training issue varied, and this fact was reflected in their respective cases-in-chief. The NRC Staff considered the remand to be limited strictly to the views of the OARP Review Committee about licensed operator training at TMI-1. The Staff testimony therefore proposed a methodology by which the Committee could make such an assessment, and compared the proposed methodology with the approach used by the Committee. See Testimony of Julius J. Persensky, Joseph J. Buzy and Dolores E. Morisseau on the Remanded Training Issue from ALAB-772 ("Staff"), ff. Tr. 33,148, at 2. UCS similarly presented an expert witness, Dr. James J. Regan, who offered his recommended methodology for analyzing training at TMI-1. Testimony of Dr. James J. Regan ("Regan"), ff. Tr. 33,532; see also Surrebuttal Testimony of Dr. James J. Regan ("Regan Surrebuttal"), ff. Tr. 32,693. The Licensee presented the panel of five experts who made up the Reconstituted OARP Review Committee.9/ See Testimony of the Reconstituted OARP Committee (Dr. Julien Christensen, Dr. Eric Gardner, Mr. Frank Kelly, Dr. William Kimel and Dr. Robert Uhrig) on the TMI-1 Licensed

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9/ In May 1984, the OARP Review Committee was reconstituted. The membership remained the same with the exception of Mr. Marzec, who was unavailable. He was replaced with Mr. Frank Kelly, an expert on licensed operator testing, who previously testified in this proceeding. See ¶ 224, infra; compare n.2, supra; see LBP-81-32, supra, 14 N.R.C. at 460-61 (¶¶ 226-29).

Operator Training Program ("Committee"), ff. Tr. 31,749; Rebuttal Testimony of the Reconstituted OARP Committee ("Committee Rebuttal"), ff. Tr. 33,320. While the Staff offered no testimony on the actual content of the current TMI-1 licensed operator training program, Licensee presented three panels of company witnesses who described the program in detail. This testimony specifically addressed questions contained in Section III.C of ALAB-772 about post-cheating management actions related to training. See Licensee's Testimony of Dr. Robert L. Long and Dr. Richard P. Coe on the Issue of Licensed Operator Training at TMI-1 ("Long & Coe"), ff. Tr. 32,202; Licensee's Testimony of Mr. Samuel L. Newton, Mr. Bruce P. Leonard and Mr. Michael J. Ross on the Issue of Licensed Operator Training at TMI-1 ("Newton et al."), ff. Tr. 32,409; Rebuttal Testimony of Dr. Ronald A. Knief and Mr. Bruce P. Leonard ("Knief & Leonard"), ff. Tr. 33,364. UCS and TMIA challenged the substantive adequacy of the licensed operator training program, both through cross-examination of Licensee's witnesses and through the introduction of exhibits offered for the purpose of establishing inadequacies in the program. See UCS Training Exhs. 1-34; TMIA Training Exhs. 1-11.

16. The Board has thoroughly considered the adequacy of licensed operator training at TMI-1. In so doing, like the Licensee and the intervenors, perhaps we have gone further into

the details of training at TMI-1 than the Appeal Board intended us to go. However, by examining operator training in considerable detail, we have ensured ourselves, the parties, and the public that the Appeal Board's concerns that prompted this remand have been fully addressed. Moreover, by becoming knowledgeable about the current program, procedures, and people involved in licensed operator training at TMI-1, the Board is able independently to evaluate the conclusions reached by the Reconstituted OARP Review Committee. Thus, the Board is in the position itself of being able to "validate" the reliability of the Committee's findings -- the issue at the heart of the remand proceeding on training.

II. Proposed Findings of Fact

A. Licensed Operator Training Program at TMI-1

1. Organization

a. Key Management Personnel

17. The TMI Plant Training10/ organization, one

10/ See Long & Coe, ff. Tr. 32,202, Attachment 5, for an organization chart of the TMI Plant Training Section.

subset of which is Licensed Operator Training, is one of four sections of the GPU Nuclear Training and Education ("T&E") Department,11/ headquartered in Parsipanny, N.J. T&E is one of four departments of the Nuclear Assurance Division ("NAD") of GPU Nuclear, which, in turn, is one of six divisions that provide support to TMI-1, TMI-2 and Oyster Creek.12/ The Licensing Board is favorably impressed with the diversity of experience and the depth of quality of the management team responsible for TMI-1 licensed operator training, as the following career summaries attest.

18. Robert L. Long, Vice President and Director-Nuclear Assurance Division. Effective April 1, 1982, Dr. Long was elected to the position of Vice President-Nuclear Assurance. The Board described Dr. Long's credentials in its initial management decision of August, 1981, when Dr. Long held the position of Director of Training and Education. See LBP-81-32, supra, 14 N.R.C. at 444 (¶ 171); see also Long & Coe, ff. Tr. 32,202, at 27-29. In summary, Dr. Long has over twenty years of experience in a variety of aspects of nuclear energy, reactor operations, and education and training. He holds the degrees of B. S. in Electrical Engineering from

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11/ See id., Attachment 4, for an organization chart of T&E.

12/ See id., Attachment 3, for an organization chart of NAD.

Bucknell University (1958) and M.S.E. and Ph.D in Nuclear Engineering from Purdue University (1959 and 1962, respectively). While with GPU Nuclear, Dr. Long has completed the Edison Electric Institute four-week Executive Management Program (1982) and Emergency Support Director training for both TMI and Oyster Creek. Id. at 27.

19. Dr. Long served as Director of Training & Education from February 1980 to March 1983. During a significant part of that time, he also served as Acting Director of the Nuclear Assurance Division (February to September 1980) and as Director of NAD (from April 1982 to March 1983). Dr. Long also served full-time for approximately three months in early 1982 as head of the Failure Analysis Task Force for the TMI-1 Steam Generator Repair Project. He has had responsibility for major changes in organization, staff, and function of the diverse areas of Nuclear Safety Assessment, Emergency Preparedness, Training & Education, Quality Assurance, and the Systems Laboratory. While serving as Director of T&E, much of Dr. Long's effort was directed to the development of facilities, the hiring and training of staff, and the evaluation and development of requirements for the TMI simulator training program, leading to the purchase of the basic principles and replica simulators. Id. at 28-29. Of course, Dr. Long also oversaw the development of the training programs which are now in place at TMI. As

discussed more fully infra at ¶¶57-63, as Director of T&E, Dr. Long bore responsibility for the cheating incidents that occurred. Id. at 29. The Board of Directors carefully considered this fact in deciding whether to promote him to the Vice Presidency of NAD. Id.

20. Richard P. Coe, Director-Training & Education Department. Dr. Richard P. Coe began serving as Director-Training & Education for GPU Nuclear on March 14, 1983. He has over twenty years of experience in a variety of educational settings, including public school, university, and industrial education and training. He holds the degrees of B.A. and M.A. in Industrial Education, and Ph.D in Educational Administration - Labor Relations. From 1961 to 1975, Dr. Coe was a teacher and administrator in the field of secondary school education. As a secondary school administrator, Dr. Coe was involved in the accreditation of high school programs and served as an accreditation peer evaluator. During the three years he was at the University of Pittsburgh, Dr. Coe was extensively involved in the development and certification of vocational training instructors. He also was actively involved in the development of the Competency Based Teacher Education Program, a nationwide program centered at Ohio State University. Following completion of his Ph.D degree, Dr. Coe also worked as an industrial training manager and consultant in training and educational

development with several large U.S. corporations. He also taught several MBA courses at the university level in organizational development and management. Long & Coe, ff. Tr. 32,202, at 29-30. Prior to joining GPU Nuclear, Dr. Coe completed professional development programs in decision analysis, budgeting and costs control, performance management, executive development, and management of human resources. Dr. Coe has completed GPU Nuclear's six-day management development program and has participated as an instructor in GPU Nuclear's instructor development program. Id. at 30-31; see Tr. 32,084 (Gardner).

21. While Dr. Coe has a non-nuclear background, he has extensive experience in industrial education, needs assessments, performance-based training, behavioral learning objectives, and training of instructors. Moreover, Dr. Coe was recommended to Licensee as an excellent classroom teacher and as an individual with effective interpersonal and management skills. Long & Coe, ff. Tr. 32,202, at 31; see Tr. 32,084 (Dr. Gardner described an instructor-training class given by Dr. Coe as "one of the best presentations I think I've seen."). Dr. Coe's strong educational background is complemented and supported by the strong nuclear experience of Dr. Long and the managers of plant training at TMI, Oyster Creek, and corporate headquarters. In Dr. Long's opinion, since his appointment, Dr. Coe has served effectively as Director of T&E by providing

strong leadership in the development of instructors, management and supervisory training, and preparation for accreditation of the licensed operator (and other) training programs by the Institute of Nuclear Power Operations ("INPO"). Long & Coe, supra, at 32.

22. Samuel L. Newton, Manager-Plant Training. Mr. Samuel L. Newton became the Manager-Plant Training in June, 1983. Mr. Newton's credentials were described by the Board in its initial management decision of August, 1981, when Mr. Newton held the position of Operator Training Manager. LBP-81-32, supra, 14 N.R.C. at 445 (¶ 175); see also Long & Coe, ff. Tr. 32,202, at 32-34. In summary, Mr. Newton has nearly twelve years of experience in the Nuclear Navy and approximately 4 1/2 years in the TMI Training Department. He has a B.S. degree with a major in Political Science and Economics from the U.S. Naval Academy (1968), and a Master's degree in Management from the U.S. Naval Postgraduate School (1969).

23. In April 1980, Mr. Newton began his employment with GPU Nuclear as the Supervisor of Licensed Operator Training at TMI. He was promoted to Operator Training Manager in September 1980. In these positions, Mr. Newton was responsible initially for supervision of the licensed operator training instructors and subsequently, as Operator Training

Manager, for supervision of licensed and non-licensed operator and shift technical advisor (STA) instructors. He was actively involved in developing training programs and procedures that were responsive to the numerous post-TMI-2 accident training reviews and recommendations. Long & Coe, ff. Tr. 32,202, at 33.

24. Mr. Newton's promotion to the position of Manager-Plant Training was based on the effectiveness of his response to the cheating incidents and his job performance throughout his entire employment period with GPU Nuclear. Mr. Newton also had served effectively as Acting Manager of Plant Training on several occasions. In the past year and a half, Mr. Newton has managed the installation and integration into the operator training program of the Basic Principles Trainer Simulator ("BPTS") and has prepared portions of the TMI training program for INPO accreditation. Id. at 33-34.

25. Bruce P. Leonard, Operator Training Manager. Mr. Bruce P. Leonard became Operator Training Manager on June 1, 1983. He has approximately six years of experience with the Nuclear Navy and two years in the TMI Training Department. He holds the degree of B.S. in Engineering - Naval Architecture from the U.S. Naval Academy (1976). His Navy training and experience include the one-year Naval Nuclear

Power Training School; completion of qualifications as Chief Engineering Officer; a variety of short programs (e.g., Quality Assurance, Water Chemistry Control, and Instructor Training); and operating and training management experience on assignments to a nuclear submarine and the S3G prototype reactor. At the S3G prototype Mr. Leonard was Staff Training Officer and had responsibility for the initial and continuing training of approximately one hundred fifty Navy Staff instructors. Since joining GPU Nuclear, Mr. Leonard has completed the six-day management development program and short courses in instructor development and decision analysis. In November 1982, Mr. Leonard began his employment with Licensee as Technical Program Specialist in the TMI Operator Training subsection. His assignments included work on the review, evaluation, and revision of training programs for licensed and non-licensed operators and STAs. Long & Coe, ff. Tr. 32,202, at 34-35.

26. Consistent with the recommendation of Admiral Rickover, as well as GPU Nuclear's own view as to its value for the Operator Training Manager, Mr. Leonard is working toward obtaining an SRO license on TMI-1. He has completed four months of an approximately six-month training program for the TMI-1 SRO license, including extensive training on TMI-1 systems and on-shift operations.13/ Mr. Leonard has performed

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13/ In late August 1984, the decision was made to withdraw Mr. Leonard from the SRO training program. This decision was

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well since joining GPU Nuclear. Id. at 35-36.14/

27. Ronald H. Maag, Supervisor-Licensed Operator Training. Mr. Ronald H. Maag recently was appointed to the position of Supervisor-Licensed Operator Training after serving as Acting Supervisor since August, 1984. He has approximately eight and one-half years of experience in the Navy, about three years in the TMI-1 Operations Department and about a half year in the Operator Training subsection. Mr. Maag holds an Associate in Science degree (1981). His Navy training and experience include the Machinist Mate A School; the one-year Navy Nuclear Power School; about two and one-half years as a staff prototype instructor; a variety of short programs (e.g., Instructor, Training, Quality Assurance, and Machine Tool Operator); and

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particularly necessary in view of the impact of ALAB-772 and NUREG-0680, Supp. 5 on workload and the assignment of supervisors in the Operator Training Subsection. Plans are for Mr. Leonard to resume his SRO training by the second quarter of 1985. Long & Coe, ff. Tr. 32,202, at 35; see also Tr. 32,680 (Newton). In the meantime, GPU Nuclear is confident that Mr. Leonard has the requisite technical knowledge and management/supervisory skills to manage and direct the activities of Operator Training.

14/ UCS questioned Mr. Leonard's technical ability to serve in his job, given his exam review responsibilities. See ¶¶ 185-186, infra; see Tr. 32,513-31 (Jordan cross-examination of Leonard); but see Tr. 33,054-56 (Leonard); UCS Tr. Exh. 32. The Board believes Mr. Leonard has an excellent technical background for his position, although obtaining an SRO license will be very advantageous to him.

about four years of operational and maintenance experience on a nuclear submarine, where he qualified as a watch supervisor. Long & Coe, ff. Tr. 32,202 at 36; Tr. 32,946 (Ross).

28. Mr. Maag began his employment with GPU Nuclear in January, 1982 as a candidate TMI-1 reactor operator. Long & Coe, supra, at 36. He has completed the RO and SRO license training programs, as well as the short courses given in supervisory development and decision analysis. Id. Mr. Maag was at the top of his class in the reactor operator replacement program; he was at the top of his class in the OJT program. Tr. 32,946-947 (Leonard). He received his NRC RO license in May, 1983 and his NRC SRO License in May, 1984. Long & Coe, ff. Tr. 32,202, at 36. He performed the duties of a licensed TMI-1 shift foreman for about two months prior to joining the Training Department as a licensed operator instructor in July, 1984. Id. at 36-37. The Manager of Plant Operations, Mr. Ross, testified that Mr. Maag's overall performance has been "excellent." Tr. 32,946 (Ross).

29. Dennis J. Boltz, Simulator Development Manager. Effective January 7, 1985, Mr. Dennis J. Boltz, previously Supervisor, Simulation Instruction, assumed the position of Simulator Development Manager. Mr. Boltz has approximately eight years of experience in the TMI-1 Operations Department (RO,

1974; SRO, 1976), and almost eight years in the T&E Department as an instructor and Supervisor. His experience includes six years as a TMI control room operator and 18 months as a TMI Operations shift foreman. Long & Coe, supra, at 38; Tr. 32,488 (Leonard). Mr. Boltz has been intimately involved with the specification, design, acceptance testing, and instructor training for the Basic Principles Training Simulator, including approximately nine months spent in essentially full-time residence at the simulator manufacturer. Long & Coe, ff. Tr. 32,202, at 38.

30. Herbert J. Lapp, Jr., Manager-Educational Development. Mr. Herbert J. Lapp began serving as Manager of Educational Development for GPU Nuclear on October 1, 1984. He has approximately fifteen years of experience in public school and industrial education and training. He holds the degrees of B.S. in Physics and M.A. in Secondary Education. From 1969 to 1980 he served as a high school science instructor, advancing to department chairman in science and math. From 1980 until joining GPU Nuclear, he served in training supervisory positions with Commonwealth Edison's nuclear plant training programs. Long & Coe, ff. Tr. 32,202, at 39. Mr. Lapp brings to Licensee considerable experience in developing performance-based training and instructor development programs. He has also served as a peer evaluator on an INPO accreditation team. Id.

31. Michael J. Ross, Manager-Plant Operations.

Mr. Ross has served as Manager, Plant Operations, TMI-1, since January 1978. Although the Training Department is organizationally independent of Operations, the Manager, Plant Operations is heavily involved in operator training both out of design (company procedures and programs mandate this involvement), and out of an interest in ensuring that the operators are trained to operate TMI-1 properly. The Board summarized Mr. Ross's credentials in its initial management decision of August, 1981. LBP-81-32, supra, 14 N.R.C. at 439 (¶ 154). In summary, Mr. Ross's background includes over twenty years of experience in nuclear power plant operations and supervision. Observing that Mr. Ross may be the most important person on the TMI-1 operating team as far as the public health and safety is concerned, we endorsed Licensee's reliance on Mr. Ross for his broad and deep knowledge of the practical operating aspects of the plant. Id. at 439-40 (¶ 155). In the context of training, the Board notes that the NRC Staff asked Mr. Ross to participate in a limited-attendance NRC forum on how to give simulator examinations. See Tr. 33,064-67 (Ross). The NRC Staff invited Mr. Ross because of his experience and interest in simulator examinations. Tr. 33,066 (Ross).

32. In assessing the qualifications of management responsible for licensed operator training, the Board agrees with the following observation of the OARP Review Committee:

> [I]n an organization that is responsible for effective training on a broad scale (with operator, technician, engineer, management, and general employee training being administered), a special mix of management, education, and experience is most beneficial to the conduct of training operations. The Committee is of the view that the T&E management in place is performing very well and has been innovative and effective in development of the GPU Nuclear training programs. The individuals cited by the Appeal Board -- in particular, Dr. Long, Dr. Coe, Mr. Newton and Mr. Leonard -- have the variety of backgrounds recommended in the 1980 OARP Committee Report. They possess the complementary skills and knowledge that, in the Committee's view, are essential to the smooth functioning and effectiveness of the GPU Nuclear training program.

Committee, ff. Tr. 31,749, at 8-9; see also, id. at Attachment 1, Special Report of the Reconstituted OARP Review Committee, June 12, 1984, ("Special Report") at 16-19. We concur with the favorable evaluation by the Committee of the capabilities of the senior people responsible for the TMI-1 licensed operator training program. See Committee, supra, at 10.15/

15/ The Board notes UCS' concern about the lack of experience of Messrs. Newton, Leonard, and Maag at an operating commercial nuclear power plant. See Tr. 32,214-16 (Jordan cross-examination of Long). The Board is satisfied, however, that these individuals hold the requisite credentials to perform their assigned responsibilities. We also note that all of these individuals have had some operating experience on the TMI-1 systems that have been utilized during cold shutdown. Moreover, there is strong involvement in the training program development and implementation by the plant operating staff, who have extensive experience. See Tr. 32,358-59 (Long); see, e.g., ¶ 168, infra.

b. Staff

33. The GPU Nuclear licensed operator training staff for TMI-1 is larger and more highly qualified than when this Board previously reviewed the training program. In 1981, it consisted of one supervisor and two instructors, who were SRO-licensed. Two contractors also were assigned. None of these individuals held degrees. Newton et al., ff. Tr. 33,409, at 25-26. Today, manpower in the Operator Training section devoted to TMI-1 licensed operator training consists of one manager, one administrative assistant, two staff positions (both with responsibilities as instructors), one supervisor, and three instructors (one who is assigned as Supervisor Non-Licensed Operator Training). Of the six personnel designated to conduct licensed operator training, four have been licensed or certified as senior reactor operators.16/ The cumulative nuclear power plant experience of the staff is forty-eight years, of which twenty-five years are commercial. The cumulative instructor experience for the Operator Training staff is twenty-nine years, of which twenty-two years are in the nuclear field. Five of the staff hold Bachelor's degrees; one holds a Master's degree as well. Id. at 26; see also Committee, ff. Tr. 31,749, at 10.

16/ Three of these licenses are current; the other is not, but the instructor is now requalifying for a current SRO license. Tr. 32,486-88 (Leonard).

34. In addition to GPU Nuclear personnel, two contractors will supplement the Operator Training staff through mid-1985. These contractors previously were licensed as senior reactor operators at TMI-1. One served as a shift foreman and the other as a shift supervisor. They have forty years of nuclear power plant experience, of which twenty-six are commercial. They have eleven years of instructor experience in the nuclear field. Newton et al., ff. Tr. 32,409, at 26. These two instructors ultimately will be replaced by permanent staff. Tr. 32,673 (Leonard).

35. Supporting the Operator Training Section is an Administrative Assistant who tracks attendance, documents examinations, and maintains records required for certification by the Vice President, TMI-1. The assignment of these tasks to the Adminstrative Assistant has enabled the Supervisor and Manager to devote more time to non-administrative tasks. Newton, ff. Tr. 32,409, at 27.

36. In addition, the Technical Programs Specialist assists the Operator Training Manager in ongoing review, evaluation, and revision of licensed operator programs. This position also is assigned to instruct operators in theoretical subjects such as reactor theory, heat transfer, fluid flow, and thermodynamics. The addition of the Technical Programs

Specialist has provided Training with additional instructor availability, and has reduced the workload of the Operator Training Manager and Supervisor, Licensed Operator Training in order that they may devote more time to program development and delivery. Id. at 27-28.

37. In addition to Licensed Operator Training, there is now a separate Simulator Development section of the TMI-1 Training Department that consists of one manager and three instructors. The credentials of Mr. Boltz, the Manager, already have been described. See ¶ 29, supra. The three instructors assigned to this section are presently in an SRO training program in preparation for qualification as SRO-licensed simulator instructors. All three have Bachelor's degrees and have eighteen years combined nuclear power plant experience, of which twelve is commercial. In addition, two licensed reactor operators are assigned from the Operations Department to assist in development of the BPTS and replica simulator programs. Newton et al., ff. Tr. 32,409, at 27.

38. UCS has pointed out on cross-examination of Mr. Leonard that a number of the instructors are new and, by inference, appears to be suggesting that the licensed operator training program instructors are inadequate, or at least, have no proven record on which they can be judged. See Tr.

32,486-90 (Jordan cross-examination of Leonard and Newton). However, UCS provided no facts to support this inference. In any event, we find satisfactory Licensee's response to UCS' concern. According to Mr. Ross, the effects, both on the training program and on the operators themselves, of the new members of the training organization have been positive: (1) the new instructors have brought fresh plant operating experience into the instructor ranks; (2) this experience has increased the instructors' (and hence the Department's) credibility; (3) the operators therefore can relate better to their instructors, knowing that the instructors have been operators and have experienced what the operators have in the plant; (4) training, therefore, becomes more palatable and acceptable. Tr. 33,060 (Ross).

39. UCS also implies that these instructors, though operationally experienced, are not instructionally competent. See Tr. 32,486-90 (Jordan cross-examination of Leonard). Prior to being hired as an instructor, however, each candidate has to perform a practice teach, during which his instructional skills are evaluated. Tr. 33,061 (Leonard). As part of the instructor certification process, each candidate must perform another practice teach, either in the one-week instructor development program or as part of the interim certification process. Id. Furthermore, before an instructor is hired, there is an

evaluation of the individual's credentials, and after an instructor is hired there are both informal instructor evaluations and required (formal) instructor evaluations. Id. In short, the process employed by Licensee ensures a prospective instructor's teaching ability.

40. UCS finally infers that the very fact Licensee has had to hire new instructors indicates a problem of some kind. See Tr. 32,486-90 (Jordan cross-examination of Leonard and Newton). However, Mr. Newton has given two appropriate reasons for the influx: (1) the original licensed operator instructors have departed from the program for various reasons unrelated to their teaching abilities or to a failure in the training organization, and (2) expansion of the training program and the budget has resulted in the hiring of new instructors. Tr. 33,061-63 (Newton).

41. The Board is satisfied that since 1981, GPU Nuclear has increased the licensed operator training staff in order to improve the training programs. We conclude that the present operational and instructor experience in the TMI-1 training department adequately supports the training programs in place. See Newton et al., ff. Tr. 32,409, at 28.

2. Training Facilities

42. One indication of GPU Nuclear's continued commitment to training is the improvement in facilities and resources available to the instructors from those noted by the OARP Review Committee in 1980.17/

43. The majority of classroom training for licensed operators is conducted in a modern training center.18/ In

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17/ In its report dated June 1, 1980, the OARP Review Committee made a number of recommendations for improvement of those activities normally handled by the Training Department. Committee, ff. Tr. 31,749, Special Report at 28. Recommendation C was that CPU should replace the temporary training facilities with a permanent training facility more conducive to learning. Id. at 30. Recommendation E stated in part that management must overtly support the importance of simulator training. Id. at 31.

18/ The newly constructed, modern training center, occupied in 1981, is a 20,000 square feet facility specifically built to meet training needs. Each classroom is equipped with zoned lighting and wall screens for projection. Audio-visual equipment available to instructors includes overhead, opaque, and slide projectors, videotape players and monitors, movie and videotape cameras, photographic equipment, and transparency and lettering machines. The inventory of equipment most frequently used by instructors has been significantly increased since 1980, e.g., in 1980 there were 7 videotape players, 8 videotape monitors, 8 overhead projectors, and 2 slide projectors. Now there are 27, 32, 24, and 10, respectively. A monthly maintenance schedule has been developed and the equipment is maintained and repaired by the plant instrumentation and control shop, providing more rapid turnaround than when commercial resources were utilized. Administrative support work for licensed operator training is done on word processing equipment and training record data is stored on GPU's main frame IBM computer in Reading, Pennsylvania. Access to the main frame is via terminals located in the training center. Newton et al., ff. Tr. 33,409, at 55.

addition to fifteen classrooms, including a large dual-purpose room which is used either as a small auditorium or as two classrooms, the building houses the Basic Principles Training Simulator ("BPTS") and its support equipment, a control room mockup, modular office spaces for a training staff of 62, a training library, file room, A-V equipment room, conference room, vending machine area and photocopy, storage and rest room areas. Newton et al., ff. Tr. 32,409, at 54-55; see also Committee, ff. Tr. 31,749, at 9; id., Special Report at 43. A second building, identical in size to the existing training center, has been designed. Construction is scheduled to start in the spring of 1985 to support the arrival of the replica simulator. The building, two-thirds of which will be devoted to training needs, will house the replica simulator and the BPTS, and will provide additional instructor work spaces and storage capacity, freeing three additional rooms in the existing building for classroom use. Individual instructor work areas will enhance conditions for one-on-one instructor-student tutoring and counseling. In addition to utilizing the facilities at the training center, space is made available on the TMI-1 site for the conduct of training. An increasing emphasis on in-plant training has moved some classroom training to component locations. This emphasis is designed for situations where practical, hands-on training has been developed as part of the

requalification program. In-plant training done over the past two years includes training on circuit breakers, the emergency diesel generators, the remote shutdown panel, the loose parts monitor, and the plant process computer.19/ Newton et al., ff. Tr. 32,409, at 55-56.

44. The BPTS was delivered in February 1984 and is now integrated into the licensed operator requalification training program. Id. at 57; see also Committee, ff. Tr. 31,749, at 9-10; id., Special Report at 61. The Reconstituted OARP Review Committee believes that the BPTS is the most advanced basic principles trainer for licensed operators in the United States. Committee, ff. Tr. 31,749, at 15; see also id., Special Report at 59-64. Furthermore, GPU Nuclear is one of only three U.S. utilities of which the Committee is aware that gives its operators training on both a BPTS and a full-scale simulator. The BPTS is intended to teach operators basic principles of neutronic behavior, reactor kinetics, thermodymanics,

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19/ The T&E Department has conducted in-plant classroom training in conference rooms in the plant to reduce time losses that result from transportation to and from the site. The T&E Department has also taken advantage of facilities at the GPU Service Corporation building in Reading, Pennsylvania to conduct requalification training for licensed operators. The operators have been shown the system power grid distribution center and provided with training on the role of and their interaction with the system dispatchers. Newton et al., ff. Tr. 32,409, at 56-57.

heat transfer, fluid flow, and PWR operational characteristics. The BPTS also provides the ability to train operators in the use of the control room pressure-temperature (P/T) plotter which allows operators to diagnose P/T behavior. This replaces the formal training provided on the computer-aided instruction system, although this training tool is still available for self-instruction by the operators. Committee, ff. Tr. 31,749, at 16-17; see also id., Special Report at 59-64; see LBP-81-32, supra, 14 N.R.C. at 449 (¶ 188) (discussion of computer-aided instruction system).

45. The BPTS simulation of plant operation is based on full scope simulator software of a nuclear generating station similar in design to TMI-1. It provides the capability to simulate in real time normal and abnormal conditions, both transient and steady state. The trainee console consists of a vertical display panel and horizontal control panel. The display panel contains a mimic drawing illustrating TMI systems and appropriate actuation switches, parameter display meters and annunciators. The control panel contains major controls and some parameter displays. Three CRT's are also available for trend display of plant parameters as well as selected calculated data, such as spatial xenon concentration or axial and radial core power distribution. An instructor's console with a CRT provides a means of controlling and monitoring operation of

the BPTS operation. The instructor can utilize such features as initialization to one of 30 plant conditions, backtrack or ability to return to prior conditions, manual time delay or insertion of malfunctions, fast time--slow time capability, and control of certain functions external to the control room. Newton et al., ff. Tr. 32,409, at 57-58; see also Committee, ff. Tr. 31,749, at 9-10; id., Special Report, at 61. We note that the BPTS requirements were established by GPU Nuclear engineers and instructors. GPU Nuclear personnel performed the job analysis for the BPTS that led to the specification of learning objectives, which resulted in designs for panel layout, layout of control rod section, etc. Thus, the simulator was designed to Licensee's specifications. Newton et al., ff. Tr. 32,409, at 57.

46. Dr. Kimel has praised the BPTS as a training device because of the flexibility produced by actual analytical models programmed into the computer circuitry as opposed to other simulators in the industry which are primarily based on table look-ups. Tr. 32,080 (Kimel). According to Dr. Kimel, such flexibility enables the trainees "to gain a real feel for the actual fundamentals based on those analytical models." Id. Dr. Kimel cites the innovative thinking of GPU Nuclear management, and in particular of Dr. Long, as responsible for the BPTS. Id. Dr. Kimel's comments about the flexibility of the

BPTS and the initiative of management apply equally to the replica simulator project. Tr. 32,120 (Kimel); Tr. 32,929-930 (Newton). See ¶¶ 52-55, infra. Dr. Christensen describes the BPTS as Dr. Long's successful response to the criticism of over-memorization as a phenomenon in licensed operator training. Tr. 32,081 (Christensen).

47. We concur with the conclusion of the OARP Review Committee that in the development of the BPTS, GPU Nuclear has demonstrated impressive design engineering capability and the ability to formulate instructional plans on how to integrate the BPTS into the training program. See Committee, ff. Tr. 31,749, at 16. In general, the Board shares the Committee's enthusiasm for the BPTS. We believe its purchase, design, and integration into the TMI-1 training program reflect management's commitment to the use of state-of-the-art technology in its program. See Tr. 32,119-20 (Kimel). It also shows management initiative and innovation.

48. The replica simulator is scheduled for delivery in late 1985. Until then, the simulator at PSI's training center at Lynchburg, Virginia continues to be the best facility for simulator training for TMI-1 operators. The PSI (formerly B&W) simulator is used for initial training, maintenance of skills and special training requirements. It is also used,

contemporaneously, by senior members of TMI Operations staff to assess operators' capabilities. In addition to its annually scheduled week of simulator training, GPU Nuclear has conducted extra training at the Lynchburg simulator in Abnormal Transient Operating Guidelines ("ATOG") and steam generator tube rupture scenarios. Committee, ff. Tr. 31,749, at 17. As described in our initial design decision, see LBP-81-59, 14 N.R.C. 1211, 1255 (¶¶ 709-710), the ATOG philosophy is a "symptom-oriented" rather than "event-oriented" approach to responding to unanticipated plant transients. In anticipation of restart, each TMI-1 operating crew also completed three additional days of refresher training at the Lynchburg simulator in 1984. Committee, ff. Tr. 31,749, at 17.

49. Quality control is exercised by the Training Department over the content of the PSI simulator training program. Committee, ff. Tr. 31,749, at 16; see, e.g., Tr. 33,288-89 (Christensen observance of modification to program at the simulator to correspond to extremely recent plant modification). The combination of the BPTS, which teaches theory, and the full-scale simulator, which provides for practice, constitutes an excellent and thorough use of simulation technology in the training of TMI-1 operators. See Committee, ff. Tr. 31,749, at 15-17.

50. Because TMI-1 has undergone several heatups and cooldowns as part of hot functional and steam generator testing, the operators also have been provided with experience in the operation of many systems and equipment at hot operating temperatures and pressures. See id. at 16. Also, of course, with fuel in the reactor, many TMI-1 systems must be checked and tested. In addition, a restart qualification program has been developed that requires each operator to complete specified evolutions which familiarize them with component operations. See ¶ 174, infra. In addition, 28 specified reactivity manipulations are conducted at the plant or on a simulator as part of the requalification program. Id. at 16-17. All of these activities provide additional training in plant operations.

51. A control room mockup has been installed in the training center and is utilized for procedure reviews, oral examinations, and classroom systems training. The mockup, which was previously located in the TMI-1 turbine building and used in human factors reviews, is a full-scale plywood model of the console and control panels and has been renovated with new photographs of the panels, which show meter indications and readings to approximate full power operation. Newton et al., ff. Tr. 32,409, at 58. The mockup has proven particularly useful in ATOG training, enabling operators to gain increased

familiarity with the procedures and locations of controls. Tr. 32,905 (Leonard). The operators review the ATOG procedures with instructors and perform a step-by-step walk-through of each procedure and reference the action controls displayed on the mock-up panels. Committee, ff. Tr. 31,749, at 17. Dr. Christensen described a valuable exercise he observed on the mockup, whereby an instructor called on various students to go to the mockup and identify the proper controls to handle the particular transient with which they were dealing. Tr. 32,077-78 (Christensen). The last replacement class favorably received the mockup training; the trainees appreciated the control room atmosphere as well as with the chance to observe the controls during breaks. Tr. at 32,905-06 (Leonard).

52. The full-scale simulator is scheduled for delivery in December of 1985, acceptance testing (validation) in January-February of 1986, and actual operation in training during the second quarter of 1986. Tr. 32,932-33 (Newton); 32,940-41 (Newton). The replica simulator is being manufactured by Singer-Link's Simulation Systems Division and will duplicate the appearance and configuration of the TMI-1 control room. It will provide a complete and accurate simulation of the systems monitored and/or controlled in the main control room and will display normal plant operations and abnormal conditions (malfunctions). The associated instructor's station

console provides the instructor with the means to monitor and control training through the use of CRT's, keyboards, and associated equipment. There will also be a hand-held remote control device which will allow the instructor to manipulate the major instructor's station control features without returning to the CRT keyboard in response to student activities during the course of an exercise. Newton et al., ff. Tr. 32,409, at 58-59.

53. An extensive specification for the replica simulator was prepared by Licensee and, following an exhaustive review of the bids, Singer-Link was chosen, largely on the basis of advances that they had made in plant process software modeling. The TMI-1 replica is a first-principles simulator, which means that a specific malfunction does not have to be pre-programmed into the software in order for the simulator to respond accordingly. The replica will be predictive rather than programmed, such that unanticipated or heretofore unrecognized transients will be capable of being simulated. The most important advancement was the development of the advanced core model, which implements the complexities of core physics and thermohydraulics into 24 radial and 9 axial regions.20/ Most of the current generation of simulators have

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20/ This model permits high iteration rate, yields a more accurate depiction of diffusion effects, and provides greater

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not used first principles models and the off-normal behaviors have been compared with (or actually used data generated from) the worst case assumptions used in the Final Safety Analysis Report hypothetical accident analyses. Id. at 59-60; see also Tr. 32,929-30 (Newton).

54. The adequacy and availability of a full replica simulator as a condition to restart was litigated in the initial management proceeding. LBP-81-32, supra, 14 N.R.C. at 468-70 (¶¶ 252-257), 570 (¶ 551); see Tr. 32,121-22 (Chairman Smith). Nevertheless, the adequacy of the program, prior to and after installation of the replica simulator, was pursued in the remanded hearing on training. See generally Tr. 31,875-77; 32,072-73; 32,078-81; 32,119-27; 32,768-70; 32,800-03; 32,927-33; 32,940-43.

55. As with the BPTS, Licensee has provided considerable technical input into the acceptance criteria for the replica simulator. Tr. 32,926-28 (Newton). Beyond its training capabilities, the simulator may be employed to

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accuracy and precision in calculating local anomalies and asymmetric conditions. The primary advantages gained are in the area of modeling of potential fuel failure from locally high heat flux, and more accurate depiction of core flux patterns and the thermohydraulics of accident conditions. Newton et al., ff. Tr. 32,409, at 59-60.

experiment on modified procedures before implementing them. Tr. 32,931 (Newton). In particular, the simulator will be able to conduct transient analysis in anticipation or at the time of a transient. Tr. 32,931-32 (Newton).

56. Until the replica simulator goes on line, simulator training at TMI-1 will depend on the BPTS and the PSI (B&W) simulator. The Board, UCS, and the NRC Staff, accordingly, inquired in some detail into the potential problem of negative transfer or habit regression. Tr. 32,124-27 (Judge Linenberger); Tr. 31,875-77 (UCS); Tr. 32,072-74 (NRC Staff). Negative transfer essentially is the transfer of incorrect knowledge, based on use of a simulator, to the actual operation of the plant. See Tr. 32,125-27 (Christensen). According to Dr. Christensen, the differences between the Lynchburg simulator and TMI-1 are sufficiently noticeable and appreciated to keep the problem to a minimum. Tr. 32,126-27 (Christensen). Moreover, as Dr. Christensen points out, negative transfer is unlikely because of Licensee's program to assure consistency between the TMI-1 plant response and the Lynchburg simulator. Id. Moreover, formal and informal debriefings occur during PSI (B&W) training to eliminate any limited negative transfer problems that may occur. Tr. 31,875-77 (Kelly). UCS' expert witness, Dr. Regan, stated that people tend to become preoccupied with creating a simulator physically identical to an

operational setting at the expense of budget and training effectiveness. Tr. 32,770 (Regan). Dr. Regan believes that a simulator, by virtue of its design as a teaching tool, is pedagogically preferable to operational equipment as a training device, and he maintains that a simulator need not have physical fidelity if it elicits behavior comparable to what an operator would experience in a real situation. Tr. 32,768-69, 32,800-03 (Regan). Exactly why a replica simulator is less effective as a training device than a non-replica one is unclear from Dr. Regan's testimony, see Tr. 32,770 (Regan), but what is clear from the record is that the value to be gained from Licensee's present and planned future uses of simulators far outweighs any burdens of negative transfer.

3. Impact of Cheating

a. Management Responsibility for Cheating

57. ALAB-772 (footnote 48) refers to the Licensing Board's concern about whether the Vice President of Nuclear Assurance, Dr. Long, understood his responsibility for the cheating that occurred at TMI. At the time of the cheating, Dr. Long was the Director of Training and Education. ALAB-772, supra, 19 N.R.C. at 1233 n.48. Licensee's post-accident upgrading of training should have included measures to prevent cheating on examinations, such as formal proctoring and review

of examinations for evidence of cheating. Dr. Long testified that between the time of the TMI-2 accident and the discovery of cheating, he overlooked the need to critically review the processes in use to prevent cheating during the examination and testing activities of the T&E Department. Long & Coe, ff. Tr. 32,202, at 2; see also LBP-82-56, supra, 16 N.R.C. at 296-97, 355-63, (¶¶ 2063-66, 2321-41).

58. The investigations and reviews of training which followed the TMI-2 accident generated a large number of recommendations. These recommendations focused on numerous ways in which various review groups felt nuclear plant training programs, particularly for licensed operators, should be changed. None of these recommendations addressed the need for control of the examination process. Thus, Licensee's failure, for which Dr. Long takes responsibility, must be evaluated in the context of the attention that was being focused on responding to the post-TMI-2 accident recommendations. Long & Coe, ff. Tr. 32,202, at 2.

59. A primary cause of cheating was the failure to provide full-time proctoring for written examinations. Id. at 3. Dr. Long testified that he does not believe that this failure stemmed from any disrespect by the TMI instructors for the examination process; rather, he feels there was a belief among

the training personnel based on their experience in educational and training programs and their knowledge of the operators, that everyone recognized that one is expected to do one's own work on an examination and that cheating not only is unacceptable, but results in penalties if apprehended. Id. A corollary of this belief was the perception at the time that the primary reason to have a proctor present during an examination was to provide clarification for students for questions they might have during the examination, not to serve as a deterrent to cheating. Id. Dr. Long admits that in retrospect, these beliefs, which he shared, were naive and should have been challenged, particularly in light of the unprecedented requirement GPU Nuclear and the NRC imposed that all licensed operators would have to undergo an additional complete NRC license examination to continue in their positions as licensed operators at TMI-1. Operations and Training management personnel should have been monitoring closely the attitudes and concerns of each individual license holder to ensure that management understood and addressed any fears, uncertainty, or gaps in the operators' acceptance of the importance of the NRC exam and their preparations for it. Id.

60. Given the personal pressures on individuals which might lead to attempts to cheat, Dr. Long acknowledges, management should have clearly articulated the guidelines for

taking examinations and should have been looking for any evidence (e.g., attempts to cheat, feelings of discouragement) which would have indicated that individual license candidates were experiencing difficulties. Also, Dr. Long states, the GPU Nuclear training program should have been structured to reinforce the view that tests are one's own work product. It was not. For this, Dr. Long takes responsibility. Id. at 4.

61. The Board notes that Dr. Long is not the only member of current management who accepts responsibility for the cheating incident. Mr. Newton, who was Operator Training Manager at the time the cheating incidents occurred, acknowledges that he had not focused his attention on procedures to prevent or detect cheating. His contributing responsibility for failings of the training program which led to the cheating incidents was reviewed with him by Dr. Long, Dr. Knief, and Mr. Hukill in a number of discussions over the past several years. In the company's judgment, Mr. Newton fully appreciates the ways in which the operator training program and personnel bear some of the responsibility for the cheating that has occurred. Id. at 33; see also LBP-82-56, supra, 16 N.R.C. at 358-59.

62. Finally, the Board shares Dr. Long's observation that the individuals who chose to cheat also have to accept the

responsibility and consequences of that choice. They could have, and should have, requested additional help from their Operations or Training supervisors or indicated in some manner that they were not ready to take the exam in question. Had they done so, Dr. Long believes Operations or Training would have been responsive and, for example, would have provided the extra training needed to prepare for quizzes and examinations. Long & Coe, ff. Tr. 32,202, at 4.

63. The Board concludes that Dr. Long was candid in his testimony and that he accepts his responsibility for the cheating that occurred. The Committee also observed and noted management's keen sense of responsibility for the cheating that occurred. Committee, ff. Tr. 31,749, at 6. These traits reflect well on both Dr. Long's character, and on his qualifications to serve as the senior manager in the company, below the Office of the President, responsible for the training of the TMI-1 licensed operators. In short, the concerns about Dr. Long raised by the Licensing Board in its partial initial decision and reflected in footnote 48 of ALAB-772 have been satisfied.21/

21/ TMIA challenged the effectiveness of Dr. Long's response to the TMI-2-generated recommendations. See, e.g., Tr. 32,219-52 (Bradford cross-examination of Dr. Long). As we previously observed, TMIA verged on default of its participation

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in the training issue. See ¶ 9, supra. Id. We noted that in the particular instance of TMIA's cross-examination of Dr. Long, TMIA had unabashedly pursued issues other than the one issue -- management integrity -- which TMIA had agreed would be its only area of "lead" interest. See, e.g., Tr. 32,234-36, 32,311-13 (Chairman Smith).

Irrespective of the problem of default, TMIA has failed to establish a foundation for the conclusion it would have us reach that management provided a mere paper response to serious attitudinal problems among employees, evidencing a lack of integrity. See Tr. 32,246, 32,265 (Bradford). These problems allegedly were reflected in TMIA Exhibits 3A-M, which were 13 attendance forms filled out by training instructors in the 1980 time-frame on which a space was provided to comment on a particular session of training. TMIA points us to comments some of which reflect dissatisfaction of the trainees with specific sessions of training. The comments are attributed to several recognizable factors, all of which have been addressed by Licensee. Five of the seven forms on heat transfer fluid flow and thermodynamics, and two of the remaining forms were from the same crew for the same week in October 1980. Tr. 32,950 (Newton). The Training Department was having some problems with this crew, and with one of the individuals in particular. Tr. 32,951 (Newton). The Training Department also was having problems with that particular instructor. Id. Over half of the forms relate to heat transfer, thermodynamics, and fluid flow -- new subject areas required after the TMI-2 accident. The operators were having difficulties understanding how these subjects related to their jobs in the control room. Tr. 32,952 (Newton). In addition, three contractors were responsible for all but one of the evaluations, and Training has had difficulty in the past integrating contracted instructors into the program, especially for licensed operators. Tr. 32,954 (Newton). Finally, all but three of the forms reflect sessions that included both TMI-1 and TMI-2 licensed and auxiliary operators ("AO's"). Tr. 32,956 (Newton). Mr. Newton suggests that a certain percentage of the negative commentaries may be by the AO's, who did not see any significant application of heat transfer and reactor theory to their job. Id. (The Training Department has since responded to this problem by creating a separate requalification program for the AO's, focusing more on plant specifics. Id.)

During the hearing, Mr. Leonard addressed whether the TMIA

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b. Management Response to Cheating

64. The two principal areas on which Licensee has focused in its overall response to cheating have been management-personnel communication and exam security. In general, the Board agrees with the OARP Review Committee that Licensee presently has in place working and demonstrably effective communication practices between management and the persons involved in the licensed operator training program, including both the training staff and operators. See Committee, ff., Tr.

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exhibits reflected a generic attitudinal problem with the shifts. He reviewed one hundred thirty other training attendance forms from August to December 1980. Tr. 32,957 (Leonard). Mr. Leonard found that only five other forms included a comment on poor operator attitudes, and they were not periodic but pertained to a certain topic (heat transfer). Tr. 32,958 (Leonard). TMIA Exhibits 3A-M therefore reflect isolated instances in an isolated time period; they do not support the existence of a generic problem with operator attitude towards training. Id.

Finally, Dr. Long explained that while he had not seen the particular documents shown to him by TMIA, he did know, and it was important for him to know, that the instructors and management under him were aware of the problem with the heat transfer classes, in particular, and were taking steps to correct the problem. Tr. 32,269 (Long). TMIA thus is attacking Dr. Long for failing to review documents describing a problem of which he already was aware. TMIA also is attempting to take advantage of a period of corporate self-analysis and self-criticism to argue that the paper generated was no more than paper. Tr. 32,312 (Chairman Smith.) TMIA's argument, however, collapses on itself: the very fact that paper was generated establishes that Licensee had an effective procedure in place to identify problems. See Tr. 32,271 (Chairman Smith).

31,749, at 22-24, 29; see also id., Special Report at 75-81. The Board also concurs with the conclusion of the OARP Review Committee that GPU Nuclear has taken a necessary precaution to prevent future cheating incidents by instituting an elaborate exam security system. See Committee, ff. Tr. 31,749, at 6; see also id., Special Report, at 25-27, 55-57. The OARP Review Committee, for one, has "never seen such stringent examination procedures." Committee, supra, at 6.

i. Communications

65. The initial Licensee management response to the cheating on the NRC exams was focused on the "mechanics" of the T&E Department examination and testing processes. Long & Coe, ff. Tr. 32,202, at 5. Immediately after the announcement of the cheating incident and during the several months of subsequent investigations, Dr. Long was directly involved with the T&E Department managers and supervisors in analyzing and developing appropriate responses to these events. Id. On several occasions Dr. Long met personally with the entire staffs of the Training Departments at both TMI and Oyster Creek. These meetings were basically question-and-answer discussion sessions to clarify issues and gain acceptance for and commitment to enforcement of the stringent examination control procedures Licensee was implementing. Id. Initially, some

instructors and trainees felt that the contents of the examination procedures were an over-reaction to the cheating incidents and that T&E was now unfairly assuming that everyone was a potential cheater. Through the open discussion of such concerns, management was able to persuade both instructors and trainees that the company had a special obligation to adopt practices which would prevent any recurrence or unjust accusations of cheating. Id.

66. Contemporaneous with the issuance of the Special Master's Report and the Licensing Board's 1982 decision, Licensee followed up on its initial response with additional activities, including the use of outside reviewers, to further respond to the "lessons learned" from the whole sequence of events brought out by the cheating hearings. The Office of the President was actively involved in these activities and met quarterly with the Director of T&E and the T&E Managers to ensure active follow-up of identified problem areas. Through analysis and discussion, management, including Dr. Long, the Office of the President, and the Training and Operations departments identified a number of root cause concerns which had to be addressed. See Tr. 32,206 (Long). These included the need to restore and maintain credibility in the training programs. The integrity of the entire training process was reviewed and more formal procedures developed for test

preparation, instructor evaluation, program planning and training interfaces with all the training "user groups." Although Dr. Long recognized from the beginning of his assignment as Director of T&E that instructors can and do influence employee attitudes, additional steps were taken to stress this impact to instructors and, particularly, to identify clearly the value of the training process to all employees. Long & Coe, ff. Tr. 32,202, at 6.

67. A significant step in restoring and maintaining credibility in the management of training and operations has been the activity of the Vice President of TMI-1, Mr. Henry Hukill. At a minimum, each licensed operator is interviewed annually by Mr. Hukill, who specifically interviews all licensed operator candidates prior to certifying them for their initial licensing or relicensing. The following subjects are discussed and instructions and guidance given to the operators during these interviews: importance of their duties to the safety and health of the public and their fellow employees; requirement for procedural compliance; importance of the NRC examination process in licensing operators; duties and responsibilities of Licensee and its employees as a regulated industry; the need for honesty and integrity in all aspects of plant operation and maintenance, including training and the examinations associated therewith; the cheating that occurred in 1981,

including possible causes therefor and the corrective measures taken; the requirement to address openly all nuclear safety-related questions or problems with management, and if they are not satisfied with the answers thereto from management, their personal responsibility to bring them to the attention of the NRC; current events, schedules, problems and incidents; and the difference between honest mistakes and intentional/willful violation of procedures and rules. Included is a discussion of the bases for procedures, rules, and regulations. Each operator is given the opportunity during the interview to ask questions or raise issues and/or problems with the Vice President. Mr. Hukill attempts to resolve, through his Staff and Training, any issues or questions raised by the operators. Id. at 6-8.

68. Another step in restoring and maintaining credibility in the training programs and management commitment to quality training has been the active program of both unannounced and announced visits to observe classroom delivery of training. TMI operator training is "audited" by both Training and Operations management and the Vice Presidents of Nuclear Assurance and TMI-1. These audits/visits provide management visibility and first-hand observation and evaluation of training. The results and conclusions of audits are, for the most part, fed back to Training except for those audits of special interest where managers feel that they have seen what they

came for, are satisfied with the results and believe there is no further need for communication. Thus, GPU Nuclear management makes frequent visits to the TMI Training Center and the visits are visible to the students in the classes. The fact that management is there and that students, including operators, can have first-hand discussions with management about their training provides the students with concrete evidence of management's ongoing concern that the training activities are carried out effectively. Id. at 8; see also Committee, ff. Tr. 31,749, Special Report at 45.

69. Another method of keeping management informed regarding the implementation and effectiveness of the training programs is the submittal by the T&E Department of bi-weekly "significant events" reports which highlight to the Division Director and Office of the President such things as training attendance, program initiations and completions, licensing and requalification exam performance, and simulator training activities. Long & Coe, supra, at 9.

70. In August of 1982 Licensee initiated, during each week of requalification training, a one-hour "Management Interface" meeting for operations, maintenance, and technician personnel attending training. This meeting is designed to inform employees of programs and policies being implemented that

affect their daily work patterns, and to assure them that management is aware and appreciates the end result of changing policies on the worker. One of the following three people attends each of these meetings: the Vice President TMI-1; the Operations and Maintenance Director; or the Plant Engineering Director. A second manager, typically from a support organization (e.g., Training, QA, Rad Con, etc.), also attends. These managers address the status of situations in their respective areas and respond to questions from the trainees in give-and-take discussions. Id. at 9; see also Tr. 33,079-80 (Newton). Mr. Hukill also sits down with the operators when a significant event occurs. Mr. Hukill explains the reasoning and the consequences of the Licensee's actions, and allows the operators to comment. Tr. 32,938-39 (Ross).

71. TMIA challenged the efficacy of the Management Interface meetings, based on a document suggesting one incident where Mr. Hukill may have failed to respond encouragingly to a maintenance worker who stood up in a Management Interface meeting and made a serious safety allegation. See TMIA Tr. Exh. 1.22/ Mr. Hukill did not testify nor was Licensee given any

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22/ TMIA Tr. Ex. 1, which was not admitted into evidence, Tr. 31,995-96 (Chairman Smith), appears to be a package of material related to an incident in which a TMI-1 maintenance worker, during a Management Interface meeting, alleged that he was being required to perform maintenance work for which express procedures were not provided. The exhibit includes memoranda about management's handling of the man's allegations.

advance notice of this subissue by TMIA; therefore, Mr. Hukill's perceptions and experiences about this incident are not known. Although it is unclear to the Board whether management was inappropriately intimidating and thereby discouraging of the free flow of information, it is very clear that Licensee must maintain a difficult balance of encouraging employees to use the "chain of command" to communicate to their management while providing for management access outside of this chain. As Dr. Kimel suggested, the very fact that TMIA Tr. Exh. 1 exists evidences the availability of another forum between management and employees for information flow. Tr. 31,992-93 (Kimel). The Board believes the Management Interface meetings are important, we recognize that they were established at Mr. Hukill's initiative, Tr. 33,079-80 (Newton), and we urge Licensee to continue to utilize them to improve existing work practices, training programs and morale.

72. Beginning in the Spring of 1983, Dr. Long initiated NAD Employee Meetings for the purposes of (1) encouraging and fostering better understanding of NAD employees regarding activities of the various Division Departments, and (2) encouraging and improving NAD relationships with other Licensee divisions. The meetings have been well-received by employees and have been continued at approximately six-month intervals. A memorandum announces each group of meetings and an agenda

prepared for the meetings at each location identifies the speakers.23/ In the first three rounds of meetings, there were five speakers, one from each NAD Department and a division Director from another division. Employees also had an opportunity to interact with Dr. Long through questions and answers and discussion. Long & Coe, ff. Tr. 32,202, at 9-10.

73. Yet another activity to keep management informed and in touch with Operations personnel is the attendance by senior managers from Nuclear Assurance, Operations, and Training at the simulator training sessions at Lynchburg to evaluate training being conducted by PSI (B&W). This allows management to evaluate the quality of PSI's training at the simulator as well as to evaluate licensed operators' and licensed operator candidates' performance on the simulator. Id. at 10. The first week of a requalification training cycle at the PSI (B&W) simulator is attended by instructors and management representatives in order to identify and correct any problems with the training before the operating shifts begin their training. Tr. 32,349-51 (Long); Newton et al., ff. Tr. 32,409, at 21; see also Tr. 32,481 (Leonard).

23/ For example, in the Fall 1984 round of meetings, NAD management gave employees training in brainstorming techniques and had them develop lists of brainstorming ideas for improving the effectiveness of the NAD work activities. Employee committees are now evaluating these brainstorming ideas to recommend those which should be further developed and implemented. Long & Coe, ff. Tr. 32,202, at 10.

74. Several activities which began in 1980 have been refined and formalized and continue to significantly aid communications between the Training and Operations Departments. To ensure that the training content is relevant to the needs of the operators, Operations management approves training programs, schedules, and program content -- including learning objectives -- prior to the conduct of requalification training. Operations (along with Technical Functions and Training) also reviews the behavioral learning objectives contained in the Operations Plant Manual ("OPM") discussed infra, at ¶¶ 113, 176, which are used as a basis for developing classroom objectives. Newton et al., ff. Tr. 32,409, at 36. Management has learned that the more mutual involvement occurs in operator training, the more focused that training becomes. Operators then are more receptive to their training. Also, at the end of each requalification training week, the shift foreman or supervisor from the crew that is just completing training meets with the Supervisor, Licensed Operator Training, the Supervisor, Non-licensed Operator Training, the Operator Training Manager, and either the shift foreman or the supervisor from the crew entering training the next week. These individuals review the week of training and determine what needs to be improved or emphasized for the following week. These meetings have helped training focus on more specific needs of different crews

regarding the same subject areas. Management personnel responsible for training also have found that they sometimes develop a common thread over six weeks useful to them in working to improve the training the next time it is scheduled. Long & Coe, ff. Tr. 32,202, at 11; see Tr. 32,350-51 (Long). The Operator Training Review Team, discussed at ¶ 198, infra, provides an additional line of communications between the Training and Operations Departments.

75. The Board finds that all of the activities cited above reflect an ongoing GPU Nuclear management commitment to find ways to stay abreast of the real and perceived concerns of its employees. We are satisfied that management has taken seriously the "lessons learned" from the cheating hearings and will continue to seek ways to maintain the credibility and integrity of the training process and the effectiveness of its contribution to overall TMI-1 plant operations activities.

ii. Exam Security

76. Another principal part of Licensee's response to cheating has been its effort to insure that individuals would never again be in a position to be tempted to cheat. The GPU Nuclear Control of Examinations procedure is a detailed process that clearly communicates to all parties Licensee's commitment to the security of examinations and the responsibility of

everyone involved in insuring the proper conduct of such exams. Long & Coe, ff. Tr. 32,202, at 19.

77. Examinations are classified in four basic security categories: Category 1 - written examinations where grades serve as a basis for certifying satisfactory completion of training; Category 2 - written examinations used as rapid feedback to assist the examiner in assessing the effectiveness of training; Category 3 - oral examinations conducted by an individual examiner or a board; Category 4 - practical factors examinations where evaluation of skill levels is based on performance of actual or simulated tasks. Id. This division into categories allows for different levels of security and administrative controls. Security of Category 1 examinations applies from the time the questions are assembled until final administration and grading. Security also applies to question and answer banks in this category. Category 1 examinations are reused without written approval by the Manager of Training. Access to Category 1 examination materials is restricted on a need-to-know basis and the policy also includes provisions for locked storage, assuring security passwords for data processing systems, limited access to exam materials, numerical accounting of exam copies, and an established question bank. In addition, there must be a 40% content difference for Category 1 consecutive weeks' training (cyclic) exams. Non-cyclic training

requires multiple exam versions differing at least 50% in content. The procedure also identifies the methods of transporting examinations between sites and the shredding of surplus examination material. The security for Category 2 exams applies from initial assembly through final grading. These exams may be reissued to subsequent classes. Category 3 and 4 examinations are less restrictive in their security. Id. at 19-20. Administration requirements and specific instructions for proctoring are clearly identified by category as well.24/ Detailed instructions for proctoring responsibilities are given.25/ Id.

78. Detailed instructions are given to the students regarding their conduct in the exam. Students must also sign a

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24/ Each Category 1 examination has a coversheet that identifies the following information: examination title and location where administered; whether the examination is open-book or closed-book; authorized reference material; any special instructions; title of each section of examination; point value of each section; total point value of examination; time limits for completing exam; minimum acceptable passing grade. Id. at 20-21; see, e.g., UCS Tr. Exhs. 21-27.

25/ The proctor must insure that student work surfaces are clear of unauthorized materials; seating assures maximum workspace for each individual by separating students as much as possible; no unauthorized information is available, e.g., from blackboards or wall charts; authorized reference materials are free of any unauthorized markings; a seating chart is made for selected examinations; examination cover sheets are reviewed with the students. At least one proctor must be present at all times and student movement is minimized. Long & Coe, ff. Tr. 32,202, at 21.

statement that indicates their understanding of the examination instructions, including an oath that the work on the examination is their own. Specific instructions are provided to those grading the exams and Category 1 examinations are graded in accordance with approved answer keys. A plus or minus two percentage points variation from the passing score is reviewed by supervision and the Operator Training Manager. Examinations are also graded in a manner that provides specific attention to detecting suspicious parallelisms among various examinations. All instances of suspicious parallelism are investigated thoroughly within one week by persons designated by the Manager of Plant Training, who receives a written report of the investigation. The Manager of Plant Training then reviews the matter with the Director of Training and Education. Id. at 21-22; see Newton et al., ff. Tr. 32,409, at 42-44.

79. After exams have been graded, an additional measure is taken to ensure that the examination has not been compromised. Comprehensive examinations, as described previously, are reviewed by either the Supervisor, Licensed Operator Training, or the Operator Training Manager, or his written designee. This collusion review consists of the reviewer selecting one-half of the questions from one-half of the students and reviewing a matrix listing the students who took the exam and the graded value of their answers for suspicious parallelisms. Id. at 44.

80. Since the control of examination procedure has been implemented there have been no known incidents of cheating or the need to pursue further initial investigations for suspicious parallelism in licensed operator training at TMI. The entire control of examinations procedure is an area of major emphasis in the GPU Nuclear instructor qualification and development programs. Long & Coe, ff. Tr. 32,202, at 22. We conclude that GPU Nuclear is deeply committed to the control of examination process.

iii. Affected Individuals

81. The Appeal Board has raised questions in ALAB-772 regarding management's judgment in its assignments and promotions of E. R. Frederick and C. E. Husted. ALAB-772, supra, 19 N.R.C. at 1224, 1235 n. 56. Although both individuals have been reassigned and are no longer involved with either licensed or non-licensed operator training, the treatment of these individual employees is relevant to the question of whether management thought through and responded appropriately to the implications of cheating.

82. Mr. Frederick. Mr. Frederick began his employment with Met Ed/GPU Nuclear in November 1973. At that time, he had approximately five years of experience in the Navy Nuclear Power Program. Since joining Licensee, he has gained

nearly five years of experience as an auxiliary operator and licensed reactor operator on TMI-2, and approximately five years of experience in the TMI Training Department as an instructor and supervisor. His Navy experience included training as an electrician and nuclear power plant operator. He received an NRC RO license on TMI-2 in October, 1977, and an SRO license on TMI-2 in January, 1982. Because Mr. Frederick was one of two licensed reactor operators on shift at the time of the initiation of the TMI-2 accident, over the past five years he also has been involved in numerous inquiries, studies, legal proceedings, and investigations relating to the TMI-2 accident. Long & Coe, ff. Tr. 32,202, at 12-13.

83. In July of 1979, Mr. Frederick began his assignment as an operator training instructor in the TMI Training Department. From the beginning of this assignment, Mr. Frederick was conscientious in his preparation, and enthusiastic and effective in his classroom presentation. Id. at 13. In February, 1982, Mr. Frederick was promoted to Supervisor Non-Licensed Operator Training when the incumbent in that position left the company. His promotion was based on a demonstrated ability as an instructor and effective interactions with other instructors and his T&E Department supervisors and managers. He also had capably served as an interim supervisor of licensed operator training in the period prior to Mr. Newton's

employment. In addition Mr. Frederick had shown a particular sense of responsibility in assisting trainees in recognizing and learning how to respond to events identified in the lessons learned from the TMI-2 accident. As Director of T&E at that time, Dr. Long concurred with and approved the Training Department recommendation. This concurrence was based on a review of Mr. Frederick's performance and on personal observations of his behavior and capabilities in Training Department activities, e.g., in the instructor development training program. Id. at 13.

84. Mr. Frederick's performance as Supervisor Non-Licensed Operator Training was excellent and he was considered a primary candidate for Supervisor, Licensed Operator Training TMI-1 when that position became available in March, 1983. See UCS Tr. Exhs. 2-5. He had maintained his TMI-2 SRO license and was enthusiastic about working towards acquiring an NRC SRO Instructor Certification on TMI-1. After reviewing Mr. Frederick's promotion, the TMI-1 Operations Department expressed some lingering concern about ensuring that what some perceived as an old "know-it-all" attitude problem had been corrected. However, they agreed that he had performed well in his recent assignments and that similar performance could be expected in the new position. Long & Coe, ff. Tr. 32,202, at 14.

85. As indicated by his performance reviews, Mr. Frederick was effective as the Supervisor, Licensed Operator Training and on occasion in early 1984 as Acting Operator Training Manager in Mr. Leonard's absence. Thus, in all of his assignments in the TMI Training Department he demonstrated his ability both to teach and to supervise the activities of other instructors. Id.

86. In March of 1984, while serving as the Supervisor, Licensed Operator Training, Mr. Frederick took the NRC TMI-1 SRO Certification examination. In early April 1984, the results were received from NRC that he had failed the exam. After careful review by the T&E Department management and a personal interview by Dr. Long with Mr. Frederick, Dr. Long was satisfied that his failure related primarily to a lack of sufficient time in the plant to be intimately familiar with TMI-1 Administrative Procedures, a section of the exam with which most March 1984 candidates had also experienced difficulty. Dr. Long confirmed that, in his judgment, Mr. Frederick did not have any attitude problem, such as over-assuredness or lack of recognition of the importance of the exam process. Id. at 14-15.

87. In June 1984, Dr. Long concurred with the recommendation of the TMI Training Department to assign an Acting

Supervisor of Licensed Operator Training to free up Mr. Frederick full-time to prepare for his reexamination by the NRC. While Mr. Frederick was in this temporary assignment of full-time study, the NRC issued NUREG-0680 Supp. 5 (July 1984), which reflected NRC Staff concerns about Mr. Frederick and an intention to withhold Mr. Frederick's TMI-1 SRO Certification so that ". . . the licensee can assign Frederick no duties associated with TMI-1 licensed operator training until these issues are resolved." Faced with uncertainty regarding Mr. Frederick's readiness to sit for the reexam, and given the NRC's position, the decision was made to withdraw his application for the TMI-1 SRO Instructor Certification and to reassign Mr. Frederick until these questions and concerns are resolved. Id. at 15.

88. UCS argues that Mr. Frederick's training performance, particularly his failure on the TMI-1 SRO exam, indicates a management failure to assign a qualified individual to the job of Supervisor, Licensed Operator Training. UCS also indicts the efficacy of the program while it was under Mr. Frederick's supervision. The chronology of UCS' case against Mr. Frederick may be summarized as follows. Mr. Frederick failed his NRC SRO exams in March 1984. Tr. 32,635-36 (Ross); UCS Tr. Exh. 1. After preparation for reexamination, Mr. Ross gave Mr. Frederick a marginal pass on his mock NRC SRO oral

exam in July 1984. This marginal pass was not in line with Mr. Ross' usual clear pass or fail for operators. Tr. 32,633-35 (Ross); UCS Tr. Exh. 1. Mr. Hukill then took the unusual action of reversing the recommendation of Mr. Ross that Mr. Frederick be certified as having met the requirements of an SRO instructor certification. From this, UCS infers that Mr. Frederick suffers from serious inadequacies in knowledge and ability. See Tr. 32,623-24 (Ross); UCS Tr. Exh. 1. UCS then suggests, again by inference, that, despite Mr. Frederick's inadequacies, he continued in the Training Department and received promotions because of his personality -- "a lawyer's favorite" -- not his ability. Tr. 32,415-22 (Newton); UCS Tr. Exhs. 2-5.26/

89. By focusing on the negatives in Mr. Frederick's training history, UCS essentially ignores the overwhelming positive performance outlined above. Obviously, Mr. Frederick was not fully prepared for his TMI-1 SRO exam, as he failed it. However, Mr. Frederick has a current SRO license on TMI-2, having met the requirements to obtain and maintain that

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26/ UCS may base its critique of Licensee's performance evaluations of Mr. Frederick on a passage in the rebuttal testimony of Dr. Regan which reflects Dr. Regan's view that ratings or personal evaluations of an individual by a superior or peer are probably the least reliable way to obtain the individual's actual performance level. Regan, ff. Tr. 33,532, at 12. See ¶¶ 192-194, infra.

license. Long & Coe, ff. Tr. 32,202, at 14. It is not reasonable to conclude that Mr. Frederick fundamentally lacked the requisite technical know-how for the job of Supervisor Licensed Operator Training, based on an initial SRO exam failure. Moreover, we agree with Messrs. Hukill and Ross that an instructor should be more knowledgeable in the specific area(s) he is teaching, but not in all subjects. See Tr. 32,947-49 (Ross); UCS Tr. Exh. 1. Indeed, as Mr. Ross observed, it would be impossible for an individual assigned full-time to the Training Department to have a superior knowledge level in all areas required for an SRO license. Tr. 32,949 (Ross). One area with which people in the plant would tend to be more familiar than people in the training facility would be administrative procedures as they pertain to operations -- the one section Mr. Frederick failed on his March 1984 NRC SRO written exam. Tr. 32,949 (Ross). Finally, contrary to the inference of UCS that Mr. Frederick rose on personality, not performance, Mr. Newton has testified that Mr. Frederick is "extremely conscientious" and "technically superb," characterizations which the testimony presented above and UCS' own exhibits confirm. See, e.g., Tr. 33,060, 32,420 (Newton); UCS Tr. Exh. 5.

90. In summary, the Board believes that the handling of Mr. Frederick during the time since the TMI-2 accident has demonstrated GPU Nuclear's commitment to evaluate its

employee's performance fairly and to advance employees appropriately based on their performance. We are satisfied that decisions regarding Mr. Frederick's advancement were carefully reviewed and, in each case, his subsequent performance verified that he could satisfactorily perform the assigned responsibilities.

91. Mr. Husted. Mr. Husted began his employment with Licensee in February, 1974. He has approximately five and one-half years of experience in the Navy Nuclear. He has about three years of experience as an auxiliary and licensed reactor operator on TMI-1 and about five years experience in the TMI Training organization. His Navy experience included training as a machinist mate and a nuclear plant watchstander. He received his NRC RO license on TMI-1 in June, 1978, and his SRO license on TMI-1 in July, 1980. In July, 1978 Mr. Husted joined Training as a TMI-1 licensed operator instructor. His performance as an instructor was consistent and improved with experience and additional instructor and supervisory training. Long & Coe, ff. Tr. 32,202, at 16.

92. During the 1981 investigation and remanded hearings on cheating, Mr. Husted displayed a serious attitude problem which led to the Licensing Board expressing "doubts . . . about his competence to instill a sense of seriousness about

the important need for integrity, discipline and public confidence in the TMI Training program." LBP-82-56, supra, 16 N.R.C. at 320 (¶ 2168). The Board recommended ". . . that the qualifications and delivery performance of Mr. Husted receive particular attention during the forthcoming review of the TMI Training program." Id.

93. Prior to the Licensing Board's decision, in June 1982, Dr. Long met with then Manager Plant Training-TMI, Dr. Knief, and the Operator Training Manager, Mr. Newton, to develop a plan of action for an ongoing assessment of Mr. Husted's attitude and performance as a licensed operator instructor. This plan included an interview of Mr. Husted by Dr. Long and Mr. Hukill, after which they were satisfied that Mr. Husted understood the seriousness with which the Company viewed his behavior in his interactions with the NRC I&E investigations, the intervenors during his deposition, and the Special Master and others during his appearance in the reopened hearings. As a result of these incidents, which Dr. Long and Mr. Hukill informed him were inappropriate, Mr. Husted was advised that his job performance and attitude would be closely monitored for an extended period. Id. at 17.

94. The monitoring program and special counseling with TMI Training Section management had actually begun prior

to the June meeting and continued on a regular documented basis through December, 1983. In addition to observations and evaluations by Training personnel, the TMI-1 Operations Department performed special observations and submitted written reports to Mr. Hukill on Mr. Husted's performance and attitudes. All of these reports indicated that Mr. Husted was performing very satisfactorily and that there was no evidence of undesirable attitudes or lack of respect for the training and licensing processes. Id.

95. In March, 1983, when the supervisory position for non-licensed operator training became open, Mr. Husted was considered as a candidate. Based on the thorough and extensive recent observations of his performance and attitudes, the TMI Training Department recommended and the Director of Training & Education, Dr. Coe, and Dr. Long concurred in his appointment as Supervisor, Non-Licensed Operator Training. In June 1983, the Commonwealth filed exceptions to the Licensing Board's decision. These exceptions challenged the appropriateness of Mr. Husted's retaining a license or instructing licensed operators. Licensee made a commitment to the Commonwealth to remove Mr. Husted's SRO license and not to use him as a TMI-1 licensed operator or instructor of licensed operators. Id. at 18. Mr. Husted performed effectively as Supervisor, Non-Licensed Operator Training until June 1984 when ALAB-772 directed that

he be removed from this position. He was then assigned to the Nuclear Safety Assessment Department to work on the TMI-1 probabilistic risk assessment project, where his excellent knowledge of TMI-1 plant systems could be used advantageously. Id.

96. It is impossible for the Board to determine whether Mr. Husted's career was given appropriate consideration in the complex controversy over his role at TMI-1. We expressed our concern about this question during the hearings. Tr. 32,320-23 (Chairman Smith).27/ However, the Board recognizes that this matter involved all sorts of judgments by GPU Nuclear management and others which were not and need not have been aired in this remanded proceeding. See Tr. 33,096-97 (Chairman Smith). Suffice it to say that decisions regarding Mr. Husted's assignments and promotion were carefully reviewed by GPU Nuclear management. Mr. Husted's subsequent performance was verified so as to ensure that he had corrected the problem

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27/ Several times during the hearing the Board also expressed concern about the licensing process leading to results which were unfair to individuals involved. We cited Mr. Husted as a possible victim of past process and Mr. Frederick as a possible victim of present process. Tr. 32,016-18, 32,212-13, 32,320-23, 32,681-83, 33,095-97 (Chairman Smith). Notwithstanding our philosophical frustration over this question, we find that as with Mr. Frederick, Licensee's handling of Mr. Husted since the cheating hearings demonstrates a corporate commitment to address employee performance/attitude problems and to resolve them if possible. See Tr. 32,320-21 (Long).

the Licensing Board had identified to him and that he could handle effectively the responsibilities assigned to him. Long & Coe, ff. Tr. 32,202, at 18. In short, management's response to Mr. Husted's conduct was appropriately thorough and circumspect.

4. The Licensed Operator Training Program

a. Methodology

97. The operator accelerated retraining program ("OARP"), developed in the aftermath of the TMI-2 accident, was designed and conducted in a manner then typical of the nuclear industry and academia -- it was a traditional, knowledge-based program that emphasized subject-matter topics and prior knowledge of the instructors. As a traditional program, it was diverse and thorough. However, it was not correlated with specific job performance requirements. Knief & Leonard, ff. Tr. 33,364, at 4; see generally LBP-81-32, supra, 14 N.R.C. at 451 (¶¶ 196-207).

98. In mid-1980, the Training and Education Department of GPU Nuclear was formed, with Dr. Long as Director and Dr. Knief as Manager of Plant Training at TMI. Dr. Long and Dr. Knief were familiar with concepts of validation and took immediate steps to shift the focus of operator training to a

performance basis. Program validity was sought in terms of both subject-matter content and job performance. Information in both areas developed in-house was compared to that available from external sources such as INPO and the NRC. Systematic training development using feedback from a variety of cognizant personnel increased content and performance validity. Knief & Leonard, ff. Tr. 33,364, at 4. Detailed consideration of Licensee's performance-based methodology is important and necessary, in view of the position taken by Dr. James Regan, UCS' expert witness. Dr. Regan in effect challenges Licensee for not making a serious and explicit attempt to relate training content to job characteristics and training performance to job performance. See Tr. 32,765-66 (Regan).

99. Although Dr. Regan (mistakenly) directs his criticism of lack of validation to the OARP Review Committee's work, see ¶¶ 278-285, infra, the real question is whether Licensee has sound basis for considering its programs to be valid. We believe it does, as evidenced by our discussion of Licensee's performance-based training approach. We also agree with Licensee's witnesses that Dr. Regan's incorrect perception is based on his lack of awareness of the considerable efforts by GPU Nuclear over the past four and one-half years to establish the validity of the TMI-1 licensed operator training program. Knief & Leonard, ff. Tr. 33,364, at 1. Dr. Regan

himself has stated that UCS assured him that his participation in the case did not hinge on his having any knowledge of specifics about the TMI training program. Tr. 32,738 (Regan); see e.g., Tr. 32,732-51, 80-81 (Regan). Dr. Regan has further stated that he was not offering any testimony about the substantive quality of the program.28/ Id.

100. Instructor training, which started in 1980, placed special emphasis on the development and use of behavioral learning objectives. In addition, instructors were introduced to the principles of training needs analysis, job and task analysis, and testing and evaluation -- topics which were later formalized as key elements in GPU Nuclear's and INPO's training system development ("TSD") models and the NRC's

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28/ Dr. Regan did not know enough about the specific tasks associated with the job of control room operator to apply his personnel performance system to TMI. Knief & Leonard, ff. Tr. 33,364, at 2, citing Regen deposition (November 13, 1984) at 157, 159, 168. Dr. Knief and Mr. Leonard noted that Dr. Regan's familiarity with the training program apparently is limited to facts gleaned during a seven and one-half day effort to review related documents and prepare his 22 pages of testimony. Knief & Leonard, ff. Tr. 33,364, at 2, citing Regan, supra, at 1. He therefore did not answer the question, "Is the instruction adequate to prepare the operators to operate the plant safely?" Id., citing Regan deposition at 168, referring to ALAB-772. Instead, Dr. Regan's testimony describes the system he would use to validate the program. Id. Apparently aware of its expert witness' limited exposure to the training program, counsel for UCS stated that they would have liked to have provided Dr. Regan with more information on a number of subjects. Tr. 32,834 (Jordan).

systematic approach to training ("SAT"). These models were developed at approximately the same time. Tr. 32,898-99 (Leonard, Newton). Subsequent revisions to the replacement and requalification operator training programs incorporated these principles. Knief & Leonard, ff. Tr. 33,364, at 4-5.

101. Moreover, Licensee implemented the TSD model as a method to develop a performance-based training program. Id. at 5; see generally Newton et al., ff. Tr. 32,409, at 29-31; Tr. 32,898-904 (Newton, Leonard). The model includes five basic elements -- analysis, design, development, implementation, and evaluation. In summary, the TSD model recommends that a new training activity be constructed using the following steps: (1) Front-end analyses first identify the nature and extent of the training needs and then identify the elements of the job and tasks of which the job is composed. (2) The design phase focuses on developing behavioral learning objectives and job performance measures which correspond to the tasks required to perform the job. (3) The development component is primarily involved with developing curricula, training strategies, and lesson plans and other materials. (4) Implementation includes the actual scheduling and delivery of the training to the subject audience. (5) Although evaluation is listed as the final step of the TSD process, and indeed in its summative form can be a final wrap-up exercise, formative

(in-line) evaluations should be conducted during and between each of the other steps to assess consistency and provide for in-line feedback to modify and improve the resulting training program. Knief & Leonard, ff. Tr. 33,364, at 5-6.

102. When a TSD approach is applied to an existing training program, in contrast to a new program under development, the initial focus is logically on the evaluation step. Strengths and weaknesses should be identified with the latter becoming the primary focus of attention and resources. Beginning in 1980, application of these principles to the licensed operator training programs at TMI-1 showed that the development and implementation phases were already conducted effectively. Licensee decided, however, that analysis, design, and evaluation could benefit from additional attention to assure proper focus on job performance.29/ Use of the TSD model was formalized in 1983. Id. at 6.

29/ In his surrebuttal testimony, Dr. Regan asserted that Licensee must not understand the TSD model because it is not possible for phases (3) and (4) to be effective if phases (1), (2) and (5) require additional attention. Regan Surrebuttal, ff. Tr. 32,693, at 5. However, as Dr. Knief explained, Dr. Regan's approach is theoretically clear, but not really correct in application. For when there is an existing, on-going program, the question is where to initially put one's resources. There is not the luxury, to which Dr. Regan may be accustomed in the research environment, of creating a new model. Tr. 33,380-82 (Knief).

103. The transition to performance-based training at TMI began through emphasis on behavioral learning objectives. These objectives identify not only subject areas required, but skills or cognitive behaviors to be mastered. Id. The behavioral learning objectives for the licensed operator were developed or revised by job incumbents or other subject-matter experts. This approach included an inherent element of informal, or "table-top" job/task analysis. Id.; see also Tr. 33,372-74, 32,457-59 (discussion of "table-top" analysis).

104. Evaluation in a performance-based setting is based on matching test items directly to the behavioral learning objectives. Focus on objectives paid the immediate dividend of allowing progress to be made simultaneously on three of the phases of the TSD model (analysis, design, and evaluation). Knief & Leonard, ff. Tr. 33,364, at 7.

105. To ensure that instructors unfamiliar with the use of behavioral learning objectives utilized them properly in the classes they taught, instructors and supervisors were trained on the writing and use of behavioral learning objectives as a means of focusing instructional and student attention on training performance requirements and of communicating program content to Operations management personnel for their added input and ultimate concurrence. Instructor training

courses, given routinely, continue the process of educating instructors in the performance-based methods utilized at TMI. In addition, the Manager of Plant Training has worked with Training staff on improving the quality of the behavioral learning objectives through instructor classroom evaluations and review of selected lesson plans. Id.

106. The validation process used at TMI evolved further between 1980 and 1982. With the issuance of NUREG/CR-1750, "Analysis, Conclusions, and Recommendations Concerning Operator Licensing" (January 1981), generic job analysis information for the licensed-operator job was available for the first time. GPU Nuclear reviewed this document to assess both the content of the then recently-issued TMI-1 licensed operator training program and new qualification cards developed to support on-the-job training activities. Id. at 7-8. The training program closely correlated with the NUREG/CR-1750 generic industry job/task analysis. Newton et al., ff. Tr. 32,409, at 30.

107. INPO Guidelines (initially christened "benchmarks of excellence") for licensed operator training also were issued in this time-frame. Knief & Leonard, supra, at 8; see also Newton et al., ff. Tr. 32,409, at 30; Tr. 32,461-62, 33,376-78 (Leonard, Knief). Comparison of their subject matter

to that of the TMI-1 program showed substantial agreement and content validity. Knief & Leonard, supra, at 8. The two programs also matched in terms of administrative requirements, such as the types of evaluations and review and approval mechanisms, which enhance performance validity. Id. In response to cross-examination by the NRC Staff as to how the GPU Nuclear training program will continue to be consistent with the INPO guidelines, Dr. Knief stated that Licensee is committed to continuing to evaluate its training program against the INPO guidelines and either to maintain consistency or have a definite reason for taking exception to them. Tr. 33,377 (Knief).

108. In 1980 GPU Nuclear instituted a program of management evaluation of simulator training. Due to their inherent integration of the entire range of job-performance skills, simulator drills and evolutions have been especially important evaluation methods providing feedback to both the training and operational arenas. They are also important mechanisms in performance validation. Knief & Leonard, ff. Tr. 33,364, at 8.

109. In addition, in 1982 the formal process for operator certification as ready to operate the plant was established to consist of an integration of several training-related performances -- classroom quizzes and examinations, on-the-job qualification, simulator and plant drills, and final written

and oral examinations. Based initially on consultation by Dr. Eric Gardner with the TMI Training Department, a workshop on testing and evaluation provided some specific guidance on construction and use of a variety of examination methods. During the workshop, the instructors developed a TMI-specific taxonomy of cognitive skills against which existing quizzes and examinations were compared to assess relative balance between memorization and higher order mental processes, such as problem solving and decision making. This training provided background for developing test specifications for annual requalification examinations. Id. at 8-9; see also Tr. 31,879-82, 32,082-83 (Gardner).

110. In 1981, INPO began its industry-wide job/task analysis project. TMI-1 supported the effort by having licensed operators complete surveys and participate in validation exercises conducted at INPO headquarters in Atlanta. Educational technologists from both the TMI and Oyster Creek Training Departments participated in workshop sessions at INPO to become trained in the process in support of plant-specific validation of the job/task lists. T&E Department management and educational technology personnel reviewed INPO's 1982 draft guidelines for accreditation of nuclear power plant training programs for consistency with the TMI-1 licensed operator training program.

111. GPU Nuclear contracted with Data Design Laboratories ("DDL") to perform an extensive evaluation of these programs using the draft INPO criteria as a basis. Their assessment of program strengths provided assurance of overall validity, while identification of specific weaknesses provided guidance for program improvement. Knief & Leonard, ff. Tr. 33,364, at 9-10.

112. The 1983 INPO generic job/task analysis was used in the continued development of the TMI licensed operator training program. This 1983 publication by INPO allowed comparison of the analyses to TMI-1 licensed operator on-the-job training ("OJT") task sheets. Through this process, TMI Training revised the OJT training program using the performance requirements established by INPO. Perhaps even more importantly, the INPO analysis provided a useful benchmark for developing training materials for the BPTS. The design of the BPTS itself owes much of both its hardware configuration and instructor-console software to upfront table-top task analysis and resulting behavioral learning objectives developed by Operations, Training, and Technical Functions personnel. BPTS training development used the much more detailed INPO results to identify those tasks for which the device is best suited. At the same time, tasks suited for training on a full scope simulator were also identified. This process supported on-going

training at what was then the B&W simulator and also was used in development of specifications for the TMI-1 replica simulator ultimately ordered from Singer-Link. Id. at 10-11.

113. The Operations Plant Manual ("OPM"), discussed supra, at ¶ 74 and infra, at 176, provides a single reference for the basic subject-matter that licensed operators need for their jobs. Developed primarily by Operations personnel, it has been supplemented through reviews by Training and Technical Functions. The presence of behavioral learning objectives for each section of the OPM provides focus not only on the key subject matter but also on the important cognitive levels associated with each element. It is extremely useful to training personnel, operators, and operator candidates as a reference tool that corresponds to both the training subject-matter and the job performance requirements. Id. at 11-12; see also Tr. 31,825, 33,325-26 (Kimel).

114. The Training Department also has taken the INPO generic job/task analysis results and prepared a job-analysis task list for the licensed operator, by using the plant-specific information provided previously to INPO by the TMI-1 licensed operators and a supplemental job analysis conducted by GPU Nuclear. Using this list, tasks are being identified which are appropriate for inclusion in the licensed operator training

program. A matrix will identify whether each task is taught in the classroom and/or on the job. The matrix also will be used to upgrade the task descriptions and performance standards contained on the OJT qualification cards. Knief & Leonard, ff. Tr. 33,364, at 11.

115. The following activities thus far have been completed in support of TSD implementation: (1) System operating procedures and surveillances have been reviewed to determine if the surveys missed any tasks; (2) The task lists have been revised to reword the tasks in such manner that they can be incorporated into OJT and simulator training programs; (3) The completed task list has been reviewed to eliminate repetition and to standardize, as much as possible, the scope of tasks on the list; (4) Operations and Training have reviewed these task list to determine which are appropriate for inclusion in the training programs and the appropriate method of training, i.e., classroom, OJT, or simulator. The efforts along these lines discussed in the preceding paragraph have been incorporated. Newton et al., ff. Tr. 32,409, at 30-31, as modified at Tr. 32,407 (Newton).

116. Using the finalized task lists, determinations of what constitutes satisfactory performance will be made. Reviews will also be conducted to ensure that the knowledge

necessary to support task performance, i.e., the knowledge necessary to perform sub-tasks, Tr. 32,456 (Newton), is included in classroom training and is supported by the Operations Plant Manual and its learning objectives. The comparisons already conducted indicate fairly close uniformity between the classroom training and the task lists. Newton et al., ff. Tr. 32,409, at 31. Results of this job/task analysis will be incorporated into revisions for the respective programs prior to their next scheduled convening dates. Id.

117. The performance-based training methods used by GPU Nuclear are not identical to the method recommended by UCS' witness, Dr. Regan; however, the Board finds that the methods are consistent with Dr. Regans's recommendations and certainly have involved many of the same elements that he recommends. Knief & Leonard, ff. Tr. 33,364, at 12; see ¶¶ 278-290, infra. Moreover, it is important to recognize that there are practical and legitimate constraints on the ability of Licensee to implement a performance system such as Dr. Regan recommends. Knief & Leonard, ff. Tr. 33,364, at 12. The licensed operator training programs in place at TMI-1 are ongoing programs, implemented on a continuous basis to a fairly small group of individuals. In this framework, test reliability, for example, is not readily established on a statistical basis. Standardization also may be impractical, as training needs change

rather quickly. Id. When Licensee decided to introduce performance-based training at TMI, it was not possible to shut down the operator training programs in order thoroughly to analyze, design, and develop them. Instead, it was necessary to continue to train, qualify and requalify operators. Over the past four and a half years, particularly with the development of the INPO job/task analyses, Licensee has expended considerable resources and effort to correlate its program with, and revise it on the basis of, performance criteria. The Board shares the opinion of Dr. Knief and Mr. Leonard that accomplishing this effort has been both necessary and advantageous. Id. at 12-13.

118. The TMI-1 licensed operator training program is performance-based. See Tr. 33,325-26 (Kimel). Notwithstanding the shutdown of TMI-1, the program's validity has been and continues to be tested by various means, such as the capabilities of the trainees on-the-job, at the simulators, in plant drills, and on examinations (oral and written). Independent evaluations have been made, as well, e.g., by the NRC Staff, OARP Review Committee, DDL, Admiral Rickover, and INPO. Numerous feedback mechanisms from trainees and Operations management to Training exist to factor in the users' views of the program. In conclusion, the Board notes that Dr. Regan himself has described his testimony as presenting a suitable scheme, but not

the only scheme. Tr. 32,808 (Regan). Licensee has presented such a suitable validation scheme.

b. Substance

119. Turning to the details of the TMI-1 operator training program, the operation and maintenance of a nuclear facility such as TMI-1 must be supported by an extensive and diversified training program, including formal classroom instruction as well as on-the-job training activities. Licensee has successfully demonstrated that it has such a program.

120. The purpose of the training programs for licensed operators is twofold. The replacement programs for new operators provide a sound theoretical and practical background to ensure that personnel understand how and why they perform specific tasks, understand how their job impacts plant and public safety, and can correctly respond to situations that they might encounter during normal and abnormal situations. The continuous requalification training program for licensed operators enhance nuclear plant safety and reliability by maintaining a high level of skill and knowledge.

121. There are three approved training programs which develop and maintain the performance standards necessary to serve as a reactor operator ("RO") or senior reactor operator

("SRO") at TMI-1: the replacement RO program, the replacement SRO program, and the requalification program for licensed ROs and SROs. Newton, et al., ff. Tr. 32,409, at 3.

i. Replacement RO Training

122. Each candidate for the RO position participates in the replacement program, which is nine months long and consists of two phases. Phase one is primarily on-the-job training ("OJT") and classroom training in reactor plant fundamentals. Phase two consists of OJT, simulator and classroom training in systems and integrated plant response. Id. at 3, 6.30/

123. Replacement operator candidates are designated by the Manager, Plant Operations. Each candidate for the program must meet the job prerequisites.31/ The RO program is

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30/ The length of time or each phase is dependent upon the needs of the specific group of trainees, whose backgrounds are evaluated prior to the commencement of the program. Two phases are utilized to provide the students with an intermixed classroom and OJT program. Prior to commencement of the training program, the schedule is reviewed with Operations management to provide concurrence that the training needs of each specific group of trainees are met. Newton et al., ff. Tr. 32,409, at 6.

31/ The prerequisites are: (1) a high school diploma or equivalency; (2) at the time of licensing, three years of power plant experience of which one year is at TMI-1. This one year of experience must include three months of performing the du-

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designed to accommodate new operators from the job market as well as the AO ranks. Newly-hired candidates from an outside source, with no AO experience, are required to complete sections of the AO OJT program32/ as well as complete or validate the plant systems and fundamentals training received by the AO's during their training program. Id. at 4.

124. Classroom training conducted for replacement operators includes coverage in the following topic areas: systems; heat transfer, fluid flow, and thermodynamics; mechanical fundamentals; radiation control and safety; reactor

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(Continued)

ties of a licensed operator while under instruction as an extra person in the control room; (3) satisfactory completion of the plant fundamentals training program unless written examination has verified that the knowledge and skill of the individual is comparable to that of individuals who have completed the training; (4) satisfactory completion of the plant systems training programs; and (5) satisfaction of the minimum medical requirements for licensed personnel as specified in 10 C.F.R. Part 55. Id. at 3-4. UCS has suggested that because the required three years of power plant experience may include experience either at non-nuclear power plants or as an auxiliary operator ("AO") at TMI-1, the RO candidates are insufficiently experienced with nuclear power plant operations. Tr. 32,472-73 (Jordan cross-examination of Newton, Leonard, and Ross.) UCS offers no evidentiary support for this position, however, and the Board has no reason to question the sufficiency of the three-year requirement, which is followed by the intensive training and retraining described above.

32/ The completion of AO OJT tasks serves to familiarize the candidates with key operating equipment and procedures while they complete the replacement operator training program. Newton et al., ff. Tr. 32,409, at 4.

instrumentation and control; reactor theory; primary and secondary chemistry and chemistry control; emergency plan; security; technical specifications; normal, abnormal, and emergency operating procedures; recognition and mitigation of consequences of accidents resulting in severe core damage; and safety analysis.33/ Id. at 4-5. During classroom training, a licensed SRO from the Operations Department is normally assigned to assist the Training Department in candidate training. This SRO provides an additional source of technical plant knowledge for the trainees and assists in counseling when required. Id. at 5. During classroom training, the status of the operator is continuously evaluated through weekly written topical tests, on which a passing grade of 80% is required. Reexams are given within two weeks for all failures. Failure of a second written test requires the Manager, Plant Operations, and the Operator Training Manager to evaluate the

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33/ To illustrate the scope of the program, when systems are taught, training includes: (a) purposes of the system and emergency functions; (b) simplified diagram showing the flow paths including instrumentation, interconnections, interlocks, all major components and control room operated equipment; (c) automatic actuation signal setpoints, interlock setpoints, and the purpose and function of these signals; (d) alarms associated with the system including the purpose, setpoint, and required operator actions; (e) limits, precautions, Technical Specifications, and, where applicable, the basis (Technical Specifications or the FSAR); (f) brief description of system operation in all modes, including normal system parameters; (g) power supplies to major components; and (h) interrelations and interfaces with other systems. Id. at 5.

student's performance and decide on the corrective action to be taken. Id. at 8. These tests are given subject to the strict security procedures discussed in ¶¶ 76-80, supra.

125. One significant illustration of the degree of involvement of Operations in the training program is the fact that the Operations Department is responsible for the conduct of the OJT programs for candidates.34/ The OJT training program encompasses the areas of (i) administrative procedures; (ii) periodic surveillances; (iii) normal, abnormal, and emergency operating procedures; (iv) technical specifications; and (v) specific job-related tasks. Id. at 6. Each candidate must complete all assigned tasks and receive oral checkouts by two levels of Operations personnel. The first checkout received is on each task identified on the OJT task sheets. The second checkout, or Final Verification, is conducted by an SRO and encompasses several related OJT tasks. If a candidate fails to complete the second level checkout, or Final Verification, the candidate's supervisor will review his performance and recommend corrective action for reexam. If an individual fails the reexam, the Manager, Plant Operations and the Operator Training

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34/ Routinely, training instructors conduct audits of candidate progress and knowledge level. Concerns resulting from these audits are forwarded to both Operations and Training. Newton et al., ff. Tr. 32,409, at 6.

Manager review the candidate's overall progress and performance and determine the corrective action to be taken. Id. at 8-9.

126. UCS criticizes the fact that shift supervisors and foremen, who are not required to go through the instructor development program, normally conduct the OJT evaluations. See Tr. 32,473-75 (Leonard, Ross). As Mr. Ross states, however, these supervisors and foremen have three major qualifications: 1) they have gone through the licensed operator training program themselves; 2) they are licensed; and 3) they have many years both of exposure to the oral exam process and of hands-on operating experience in the plant. Tr. 32,474, 32,477 (Ross, Leonard). UCS has failed to identify precisely what essential skills an OJT evaluator may lack because he has not participated in the instructor development program. TMIA also has attempted to challenge the OJT check-out procedure. See Tr. 32,639-54 (TMIA cross-examination of Leonard and Newton). TMIA apparently believes more instructors should be conducting check-out evaluations and therefore Licensee's staffing of the program is inadequate. See Tr. 32,639-49 (Bradford cross-examination of Newton and Leonard).35/ However, there is no

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35/ With the concurrence of Operations, Training plans to become more involved with OJT, with instructors assigned on shift to assist the supervisors and foremen in giving checkouts. Tr. 32,642 (Newton).

self-evident reason why shift personnel cannot give OJT check-outs, nor have the intervenors provided one. To the contrary, these individuals appear to us to be in the best position -- i.e., most technically knowledgeable -- to perform this function.

127. In phase two of the replacement RO program, three weeks of simulator training are provided for each candidate at the PSI (B&W) plant simulator in Lynchburg, Virginia. This training is designed to reinforce classroom and OJT concepts and to develop the operator's knowledge in integrated plant response.36/ Training conducted at PSI utilizes TMI-1 plant procedures. When candidates are sent to the simulator for training, an SRO is normally assigned to accompany them. The SRO provides TMI-specific input and evaluates the operators and instructors on their performance. See Tr. 32,078-79 (Dr. Christensen's description of the interaction between the SRO and the operators as "lively" and "dynamic"). Any deficiencies

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36/ Simulator program content is determined prior to the initiation of the training. PSI has developed a standard three-week control room operator program which it issues to its customers. Using this classroom and simulator schedule as a base, the Operator Training and Simulator Training sections of the TMI Training Department develop a more site-specific program. The Supervisor, Simulator Instruction, and Supervisor, Licensed Operator Training, provide input to PSI regarding topic selection, planned evolutions and drills, and instructors. Newton et al., ff. Tr. 32,409, at 6-7.

in operator or instructor performance are discussed with PSI and TMI Operations and Training management.37/ In addition, an operational exam is administered by the Manager, Plant Operations, or his designee at the completion of the three-week simulator program. Drill scenarios are developed by the Manager, Plant Operations, and provided to PSI at the time of each exam. The objective of the operational evaluation is to test the candidate's ability to safely operate the plant through an assessment of the candidate's knowledge of procedural requirements, systems, system response, plant operations fundamentals, and integrated plant response. If a candidate fails the operational exam, the Manager, Plant Operations, and Operator Training Manager review the candidate's training performance record and determine required corrective action. Newton et al., ff. Tr. 32,409, at 6-7.

37/ UCS has made two inferences concerning the appropriateness of sending these SRO's to Lynchburg: 1) the SRO's are unqualified; and 2) they are biased in their evaluations. Tr. 32,477-79 (Jordan cross-examination of Leonard and Ross). The Board finds no support in the record for these inferences. Mr. Ross and Mr. Leonard select the SRO's on the basis of their technical background and their ability to communicate. Tr. 32,478 (Leonard). The Board cannot infer that these bases indicate lack of qualification; to the contrary, Licensee appears to be conscious of the need to pick an individual who is both knowledgeable and able to verbalize that knowledge. Nor is the system biased. While a trainee may assigned to the SRO's shift, trainees at PSI usually represent four or five different shifts. Tr. 32,479 (Ross).

128. Successful completion of the replacement RO program requires that the candidate satisfactorily complete written examinations with a grade of 80% or better; satisfactorily complete OJT checkouts, including "Final Verification" checkouts; pass a simulator startup certification and an operational evaluation conducted by the Manager, Plant Operations, or his designee; and pass (80% overall, 70% per section) a final comprehensive written and oral examination. Id. at 8. The oral exam consists of an oral board on plant fundamentals and a plant walk-through. Personnel from Operations and Training are assigned to the oral board. A licensed or certified SRO is assigned to conduct the plant walk-through. Id. at 9. After the candidate completes the assigned training program, the Director, TMI-1, must certify that he is ready to take the NRC RO license exam. Id.; see LBP-82-56, supra, 16 N.R.C. at 365-66 (¶¶ 2348-51); LBP-81-32, supra, 14 N.R.C. at 448 (¶ 187).

ii. Replacement SRO Training

129. The TMI-1 Manager, Plant Operations, TMI-1 shift supervisors and shift foremen, and specified TMI-1 instructors participate in the SRO replacement program. The replacement program accommodates candidates promoted from the RO position, as well as individuals seeking an SRO license directly without having been previously licensed as TMI-1 RO's. A majority of

the candidates for the direct SRO program are Shift Technical Advisors ("STA") and degreed Training staff. This program also accommodates engineers involved in plant support. The SRO replacement programs are normally six months in length. Id. at 9-10.

130. Each candidate for the SRO program must satisfy specified minimum qualification requirements.38/ Newton et al., ff. Tr. 32,409, at 10-11. The Manager, Plant Operations, designates candidates for the SRO program, using the specified prerequisites. Id. at 11.

131. The program content for both the replacement and the direct SRO programs is designed to provide classroom, simulator, and on-the-job training in the following areas: supervisory course in decision analysis/supervisory development; supervisory control room and plant operating experience, directed by specific task assignments and licensed senior operators; reactor theory; plant design and operational characteristics; plant control systems; radiation control and safety;

38/ The concern we inferred from UCS' questioning on the power plant experience necessary to qualify for the replacement RO program, see supra, n.31, apparently also applies to the replacement SRO program. Tr. 32,472-73 (Jordon cross-examination of Leonard and Newton). Furthermore, UCS has failed to move beyond inference and show that the requisite four years of power plant experience, two of which must be nuclear, amounts to insufficient experience.

plant transients; and recognizing and mitigating core damage. Id.

132. Classroom training is conducted to emphasize the SRO's role in plant control. Specific schedules are developed for each replacement class based on candidate experience. The Operations and Training Departments confer on training schedules prior to issuance to ensure that training needs for each class are met. Id. at 11-12.

133. UCS' expert, Dr. Regan, suggested that the key training that operators need is in how to deal with situations for which there are no clear-cut procedures. Tr. 32,799 (Regan). Dr. Regan was unfamiliar with the nature of the three-day training session on decision analysis that is given to all SROs. Tr. 32,840-41 (Regan). Decision analysis trains individuals (a) to handle complex situations for which written procedures do not exist; (b) to develop a technique to cope with uncertainty, stress, and conflicting information and to make decisions in the face of such circumstances; and, (c) to make "good" decisions, i.e., to consider fully and understand the significance of alternatives and to factor in the most important considerations. Decision analysis training develops in control room supervisory personnel the tools and sensitivity to make the right decisions under highly adverse circumstances,

and to do so in a systematic and thoughtful manner. Newton et al., ff. Tr. 32,409, at 12; see LBP-81-32, supra, 14 N.R.C. at 453 (¶ 200).39/ Moreover, operators receive training at the PSI simulator on scenarios for which there are no clear-cut procedures. Tr. 32,920-21 (Ross).

134. The OJT program for SRO candidates consists of day-to-day tasks which involve participation by the SRO candidate in shift foreman-related activities designed to reinforce classroom study and maximize new learning experiences. The OJT program consists of tasks related to 1) secondary systems; 2) primary systems; 3) administrative procedures; 4) normal, abnormal and emergency operating procedures; 5) technical specifications; and 6) shift foreman duties. The selection of OJT tasks for the direct SRO program is completed using input from the Operations and Training staffs. The program combines the OJT from the replacement RO and SRO programs, as well as selected tasks from and checkouts on systems listed in the AO program. Each candidate is examined on these tasks. Final verification checkouts are conducted by shift supervisors on groups of related tasks. This verification serves as a second

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39/ In addition, each candidate attends six sessions of the Zenger-Miller supervisory course. These sessions include instruction on giving recognition to employees, communicating effectively, listening, improving employee performance, and delegating. Newton et al., supra, at 12.

check. Id. at 12-13.40/

135. Simulator training for each SRO candidate is conducted by PSI at Lynchburg, Virginia. The program content for the simulator training is determined prior to training being conducted by PSI. PSI has developed a standard two-week SRO program.41/ As with the replacement RO program, the Operations and Training staffs use this program as a foundation for the development of a TMI-1 specific program. The Supervisor, Simulator Instruction, and Supervisor, Licensed Operator Training, provide input to PSI regarding topic selection, planned evolutions and drills, and instructors. Id. at 13.42/

40/ UCS makes the same criticism of the individuals responsible for OJT evaluations in the replacement SRO program as it made concerning the RO program. Tr. 32,475-77 (Jordon cross-examination of Leonard); see supra, ¶ 126. Our analysis of that criticism applies here. Furthermore, because only licensed SRO's may give checkouts in the SRO program, UCS counsel himself acknowledged that the size on the group that was qualified for this role was smaller and more restricted. Tr. 32,476 (Jordan).

41/ Trainees in the direct SRO Replacement Program receive additional simulator training beyond the two weeks normally conducted for replacement SRO candidates. The goal of this additional training is to provide training on control panel operation, and expose the candidate to an increased number of normal and abnormal plant operations. Newton et al., ff. Tr. 32,409, at 13.

42/ As in the RO program, a licensed SRO is normally assigned to accompany the SRO candidates to Lynchburg, with the same tasks as the SRO who accompanies the RO candidates. UCS again questions the qualifications and impartiality of the SRO who

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136. To complete the SRO training program, a candidate must satisfy the same requirements as in the RO program. A direct SRO also must pass a Startup Certification Exam. As outlined in the RO program discussion, weekly quizzes, OJT checkouts, and comprehensive examinations are conducted, and results of examinations and quizzes are used to evaluate the competency of the candidate. The Director, TMI-1, again must certify all candidates before they take their NRC exams. Id. at 14.

iii. Requalification Training

137. Upon licensing by the NRC, each operator is assigned to participate in an ongoing requalification program. The goal of the licensed operator requalification program is to enhance nuclear plant reliability and safety by maintaining a high level of skill and knowledge in licensed RO's and SRO's. The requalification program is implemented utilizing the following interrelated segments: pre-planned lecture series;

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helps evaluate the shifts at the simulator. Tr. 32,480-483 (Jordan cross-examination of Newton, Leonard, and Ross); see n.37, supra. Our discussion in n.37 again applies, with the addition that the qualifications are generally higher for the SRO sent down for the SRO, as opposed to the RO, program. Tr. 32,482 (Leonard).

skills training and evaluation; operational review program; and annual examination and evaluation. The operator requalification program is conducted on a cyclic basis so that all program requirements are completed in a period not to exceed two years. Id. at 15. To ensure that requalification training fulfills its purpose, all TMI-1 Operators shift personnel are scheduled on a six shift work cycle with one of the six shifts dedicated to training. In cases where identified training cannot be completed within the one shift week devoted to training, additional time is scheduled during the operating crews' relief week, or on overtime as necessary to complete required training. Id. at 3.

138. Lectures. The Pre-Planned Lecture Series consists of two types of lecture programs, the Fundamentals Review Lectures and the Operational Proficiency Lectures. The Fundamentals Review training sessions cover areas in which the knowledge required of a licensed individual is relatively constant. The topics presented in the Fundamentals Review series reflect the results of the annual examinations and the performance of the licensed personnel as evaluated by the Manager, Plant Operations, and the Operations and Maintenance Director, TMI-1.43/ The depth of coverage in each topic addresses

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43/ The lecture topics are selected on an as-needed basis from the following list: Theory and Principles of Reactor Opera-

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deficiencies identified by the annual examinations, as well as those identified by the Operations Training Coordinator, who is the direct liaison for training in the Operations Department. The Operational Proficiency lecture topics are selected to ensure coverage of essential plant operational guidelines and to ensure that operational changes and experiences are integrated into licensed individuals' training.44/ The depth of coverage in each topic reflects the knowledge required of the licensed SRO, as does the material for the fundamental review training. Id. at 15-17.

139. The Pre-Planned Lecture Series is scheduled on an annual basis. The lecture series is held on a continuing basis with a weekly schedule of lectures designed to be

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tion; Theory and Fundamentals of Heat Transfer, Fluid Flow and Thermodynamics; Features of Facility Design including Plant Systems; Nuclear Plant Operating Characteristics Including Operating Experience; Plant Instrumentation and Control Systems; Plant Protection Systems; Engineered Safety Systems; Radiation Control and Safety and Plant Chemistry; Applicable Portions of Title 10, Chapter I, Code of Federal Regulations; and Fuel Handling. Newton et al., ff. Tr. 32,409, at 16.

44/ The lecture topics are selected from the following list: Normal, Abnormal and Emergency Operating Procedures and changes thereto; Administrative Procedures, Conditions and Limitations and Technical Specifications and changes thereto; Major Operational Evolutions; Facility Design and License Changes; Operating History and Problems; Related Nuclear Industry Operating Experience; and Mitigation of Accidents Involving a Degraded Core. Id. at 16-17.

repeated for each shift during its training week. It typically involves up to 240 contact hours of instruction divided among the program topics which are appropriately scheduled throughout the year. Id. at 17.45/ For each training session of the lecture series, a lesson plan is prepared, reviewed, and approved in accordance with Training Department procedures. Id. at 17.

140. Skills Training. The Skills Training and Evaluation segment of requalification is conducted so that each licensed operator participates in frequent and varied plant evolutions in order to maintain an acceptable level of skill and familiarity with the nuclear plant systems, controls, and operational procedures. Each licensed individual must demonstrate operational proficiency by participating in reactivity manipulations and plant evolutions,46/ nuclear plant simulator

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45/ All licensed operators are required to attend the Preplanned Lecture Series. Absences are approved in advance by the Manager, Plant Operations, or the Operations and Maintenance Director, Unit 1, and are normally limited to one training week per year. Additional absences, unless approved by the Manager, Plant Operations, result in the individual's removal from licensed duties and placement in an accelerated requalification program until such time as the missed material is made up. Id. at 17.

46/ To provide proficiency training for normal plant evolutions, each individual participates in plant evolutions on an annual basis. Newton et al., ff. Tr. 32,409, Attachment 4 (list of evolutions). Individual performance during these plant evolutions is monitored and deficiences corrected so that satisfactory proficiency is demonstrated. To provide profi-

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exercises, BPTS exercises, and the plant drill47/ program. To maintain these skills, licensed RO's must actually manipulate plant or simulator controls, while licensed SRO's may either manipulate or actively supervise manipulation of controls. Reactivity manipulations, plant evolutions, and exercises which are considered in the simulator training program include normal plant evolutions, abnormal/emergency plant evolutions, verification of plant operating procedure adequacy, and demonstration of plant response to conditions identified from nuclear

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ciency training in abnormal/emergency plant evolutions, each individual, on an annual basis, participates in training exercises covering plant abnormal/emergency conditions. See id., Attachment 5 (list of annual conditions). These evolutions are conducted either at the simulator or during the plant drill program. On a two-year cyclic basis, each licensed individual participates in training exercises covering additional plant abnormal/emergency conditions. Id. at 19; see id., Attachment 6 (list of biennial conditions).

47/ Plant drills are conducted in order that each licensed individual actively participates in drills covering abnormal/emergency plant evolutions which are not adequately covered in the nuclear plant simulator training program. Plant drills are structured to review or carry out actions required to respond to abnormal/emergency plant conditions. Plant drills are conducted with the approval of the Manager, Plant Operations, on an individual or team basis and usually involve: reviewing plant procedure steps; identifying actions required to establish stable plant conditions; identifying equipment control locations and functions; identifying expected plant instrumentation and alarm response; reviewing communications necessary to gather information or coordinate team actions; and identifying supplementary actions aimed at mitigating results or causes of plant abnormal/emergency conditions. Id. at 21.

industry operating experiences. Id. at 18. Exercises involve multiple failures and/or operator error, and utilization of applicable plant procedures and technical specifications. Individual and operational team performance during the abnormal/emergency training exercises is monitored. Id. at 19.

141. Each licensed individual completes nuclear plant simulator training sessions involving a minimum of twenty hours of direct interaction with the simulator nuclear plant control panel on an annual basis. Since 1982, lectures at PSI have contained TMI-specific information, e.g., TMI heatup and cooldown curves, fuel mechanical performance, fuel in compression curves, core power peaking, integrated control system failures/operation, emergency feedwater effectiveness, RCP operations guidelines, ATOG, and OTSG tube rupture. The content of these lectures is directly under the control of the Operator Training section, which is a significant improvement from the pre-1982 lectures which were provided by PSI as generic topics. Id. at 19-20. In developing the simulator training program, the Operations Department works with the Training Department to establish a list of topics for classroom training as well as an outline for simulator drills.48/ The Operator

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48/ As previously discussed, at the start of each training cycle, a group of TMI-1 operator instructors and nonshift licensed operators from Operations participate in a prototype simulator training program. See ¶ 73, supra.

Training section develops lesson plans and objectives for the classroom program, and the Simulator Development section develops drill sequences and drill guides. The two Training sections work together to ensure that the classroom and simulator sessions provide continuity within the training program. The simulator training program is approved by Operations and Training and sent to PSI for review prior to its commencement.49/ During the 1983 training cycle, simulator training for licensed operators was expanded to include an additional week of ATOG training and three days of steam generator tube rupture training. During the 1984 cycle there have been three additional days of operator proficiency training. Id. at 20-21.50/

49/ UCS has attempted to apply its critique of the SRO who accompanies RO and SRO simulator crews during replacement training, see nn. 37, 42, supra, to the requalification program. Tr. 32,480 (Jordan cross-examination of Newton and Leonard). As Mr. Leonard explained, however, the purpose of the requalification program is different from the purpose of the replacement program. Tr. 32,480 (Leonard). Because the shift supervisors and foremen who normally would serve as the accompanying SRO's are themselves receiving training at PSI, the individuals responsible for evaluating crews are those qualified as emergency directors, such as Messrs. Ross, Toole, Colitz, and Hukill. UCS' analogy between the replacement and requalifications programs thus breaks down before UCS even gets to the point of challenging the qualifications of the evaluating personnel.

50/ In addition to meeting the requirements for skills training participation noted above, off-shift licensed personnel assigned to the Operations Department actively participate

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142. Mr. Ross has an active role in the evaluation of operator performance on the PSI (B&W) simulator. He gives the majority of the simulator examinations for requalifying crews and replacement operators. Tr. 32,619-620 (Ross). Mr. Ross selects the scenarios (which he keeps confidential until the moment of the exam). Tr. 32,620 (Ross). He then makes the judgment on the overall grade, with input from the B&W instructors. Id.

143. Operational Review. The Operational Review Program provides a system for on-shift review of selected operational experiences and changes to existing operating guidance or equipment. The program enables continuous updating for on-shift personnel by establishing a means of disseminating new or changing information rapidly. Newton et al., ff. Tr. 32,409, at 22. A continuing system exists to ensure that licensed individuals review documented plant design changes, equipment

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in control room operation a minimum of one shift per month. Licensed instructors from the Training Department staff and other on-site licensed personnel actively participate in control room operation a minimum of two shifts per month. During this period, these licensed personnel must assume (actual or under instruction) and perform the duties of the on-shift licensed operator. Failure to meet this requirement on a quarterly basis results in placement in an upgrade program. Newton et al., ff. Tr. 32,409, at 22.

modifications, procedure changes, and technical specification changes. Selected changes and modifications are analyzed and information pertinent to the basis for the changes and their operational implications is collected and formally transmitted to all licensed individuals with acknowledgement of review required. Changes to emergency procedures and technical specifications require review by licensed operators. Id. at 22-23.51/

144. Training is conducted to incorporate operating experience review from TMI-1 and the industry. Selected operational events and reportable occurrences at the facility are analyzed and information pertinent to the event collected. Selected operational information from the nuclear industry is analyzed using Licensee Event Reports, audit, evaluation, and inspection reports, publications and periodicals covering nuclear industry information, and NSAC/INPO Significant Event Reports. Technical Functions personnel assigned to assess plant operating experience and the Training Department specify operating experience to be analyzed for training purposes.52/

51/ To ensure operators are kept informed on plant procedure changes, each on-coming shift of licensed operators is required to review a revision book. This process ensures significant procedure changes are pointed out promptly to the operating crews. Id. at 64.

52/ When the Plant Analysis Section of Technical Functions sends a recommendation, the Training Department must acknow-

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Selected nuclear plant accidents/transients from industry operating experience are analyzed and, where applicable, integrated into the simulator exercises, the plant drill program, or classroom training. The Training Department sets aside between one and two hours during every six-week requalification training cycle to cover relevant industry events that have occurred since the previous cycle. Tr. 32,936 (Newton). Additionally, information can also be formally transmitted to all licensed individuals with required acknowledgement of review. Id. at 23. Operators are kept abreast of plant modifications first by training handouts generated by Operations management, and later by formal classroom training on these plant changes. This approach immediately informs operators in the field when a system change takes place so they can be aware of its proper

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ledge and respond to the recommendation by returning a response sheet. Tr. 32,934-35 (Newton). Mr. Newton further explained that the significant event reports distributed by INPO are tabbed red ("urgent"), yellow, and green ("routine"). The Training Department receives an additional copy of these reports from Technical Functions. The Training Department must respond to the copy from INPO, which evaluates Training's response. INPO also sends "good operating practices" recommendations to Mr. Ross as Manager, Plant Operations. Tr. 32,937 (Newton).

The required Training responses to Technical Functions and INPO and the overlapping copies of INPO significant event reports provide assurance that the Training Department is not only receiving industry recommendations, but is also responding to them.

operation. Later in their normal requalification training this material may be presented in a formal classroom atmosphere. Newton et al., ff. Tr. 32,409, at 63. The Board finds that Licensee has in place an adequate mechanism for monitoring internal and external events requiring consideration and possible change.

145. Annual Examinations. To determine each licensed individual's knowledge of topics covered in the requalification program and provide a basis for determining areas in which retraining is needed, an annual examination is given to all licensed individuals prior to the completion of each annual requalification program cycle. It consists of an oral examination and a written examination. Id.

146. The written examination contains questions covering the topics addressed in the Fundamentals Review Lecture Series and the Operational Proficiency Lecture Series. The examination is structured so that the level of questioning is consistent with the individual's license level (RO or SRO). Each licensed individual receiving a grade of less than 70% in any examination category or an overall grade of less than 80% is relieved of his license duties and placed in an accelerated requalification program.53/ Id. at 24.

53/ Under special circumstances where a grade of less than 70% has been scored in a single section with the overall average

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147. An oral examination is also administered to licensed individuals. The oral examination contains questions covering many of the following areas: licensed duties and responsibilities of the operating position corresponding to the individual's license level; actions in the event of abnormal conditions; actions in the event of emergency conditions; interpretation of instrumentation responses; plant transient and accident response; plant modifications; procedure changes; technical specifications; emergency plan; plant operating history and problems; and related nuclear industry operating experiences. Oral examinations are conducted by a licensed SRO or an individual who has successfully completed education and training programs required for an SRO license. Each oral examination is structured so that the oral examination is at least two hours long; normally, it is considerably longer. Id. at 24-25.

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greater than 80%, the Vice President, TMI-1 may document the special circumstances and authorize an oral and written reexamination of the failed section within one week. If the oral exam is completed satisfactorily and a grade of 70% or greater is scored on the single written section, the individual may return to shift in a licensed status with the approval of the Vice President, TMI-1. Id. at 24.

148. The oral examination involves sessions conducted in the plant control room and in plant areas normally entered by individuals whose actions are directed by the licensed operator. A failing overall oral examination grade requires the licensed individual to be removed from his licensed duties and be placed in an accelerated requalification program. The content of an accelerated requalification or special retraining program is specifically structured to upgrade knowledge and skills identified as deficient. Id. at 25.

149. UCS has focused a significant part of its cross-examination on the training histories of two currently licensed RO's, Jay E. Moore and John J. Walsh, and an SRO, H. Keith Olive. See, e.g., Tr. 32,422-53, 32,624-32, 33,434-44 (Jordan cross-examination of Newton, Leonard, and Ross). Eighteen of UCS' thirty-four exhibits involve Messrs. Moore, Walsh, or Olive. See UCS Tr. Exhs. 8-16, 21-28, 30. UCS apparently seeks to show from these individuals' training histories the inadequacy of Training and Operations Departments which allow these operators to continue in the program.

150. The three exhibits introduced by UCS on Mr. Walsh are coversheets documenting one mock NRC RO written exam failure in 1983, one mock NRC RO written exam pass in May 1983, and one annual requalification exam failure in March of

1984. UCS Tr. Exhs. 21-23, respectively; Tr. 32,624-27 (Jordan cross-examination of Leonard and Ross). Based on the results of these three exams, UCS would have this Board find that the Licensee erred in its decision not to remove Mr. Walsh from the program, and thus hold that the current organization, with its flawed judgment, is inadequate to train competent operators. The evidence introduced on Mr. Walsh is grossly inadequate to justify UCS' proposed finding. We find that, rather than undermining the Licensee's judgment, the evidence supports its judgment, reaffirms the decisions to keep Mr. Walsh in training, and justifies the policies and procedures of the Licensee with regard to exam failures.

151. Mr. Walsh failed the company-administered mock NRC exam required by Licensee (but not by the NRC) prior to certification. Tr. 32,624-27 (Ross, Leonard). However, he subsequently passed that exam in May, and passed his NRC RO license exam on the first try. Tr. 32,627, 32,659 (Leonard). Mr. Walsh also failed one of four sections of his March 1984 requalification exam. Tr. 32,625-27 (Ross). Licensee procedure required that Mr. Walsh be immediately removed from licensed duties and placed into an accelerated upgrade program. Tr. 32,627 (Leonard). Mr. Walsh then had to and did take and pass a reexamination. Id.

152. The Board is satisfied that these procedures struck a balance between Licensee standards and individual fairness. One way to judge past decisions by the Training and Operations Departments is to look at subsequent performance by the operator. Since being licensed, Mr. Walsh has satisfactorily completed the requalification program. Tr. 32,959 (Leonard). His average score on the 1983 requalification cycle weekly examinations was approximately 90. Tr. 32,959-60 (Leonard). His average score on the current requalification cycle -- Cycle 84 -- weekly written examinations has been approximately 92, above average for the class as a whole. Tr. 32,959 (Leonard). Mr. Leonard stated that the current success of Mr. Walsh in the requalification program is consistent with his performance since passing the NRC licensing exam. Id. Neither the Training nor Operations Departments have any reason to believe that Mr. Walsh should not have been allowed to continue in the program based on his earlier failures. Tr. 32,960 (Leonard); Tr. 32,962 (Ross). The Board would simply add that consistent performance by a superb student probably says more about the student than the program, but improved performance by a student who began with difficulties reflects highly on the efforts of the Training and Operations Departments.

153. The case of Mr. Moore echoes that of Mr. Walsh. UCS' training exhibits document a mock NRC written exam failure

in January 1983, a mock NRC written reexamination failure in early February 1983, and a mock NRC written reexam pass in mid-February 1983. UCS Tr. Exhs. 24-26. Mr. Leonard agreed with UCS' summary that UCS Training Exhibits 24, 25 and 26 reflect the decision "to allow Mr. Moore to go ahead after he failed the exam reflected in Exhibit 24 with additional training in order to take the exam as reflected in Exhibit 25, and then after having failed the exam reflected in 25 the Company allowed him to go ahead and continue and take the exam reflected in Exhibit 26." Tr. 32,630 (Leonard). As in the case of Mr. Walsh, UCS again questions the judgment of the Training and Operations Departments in their decision allowing Mr. Moore to continue in the program. See Tr. 32,630 (Jordan cross-examination of Ross).

154. We once again conclude that the evidence prevents the Board from finding what UCS proposes. After completing the replacement RO program in February 1983, Mr. Moore the same month passed the NRC RO licensing exam on his first attempt. Since then Mr. Moore has participated in the Cycle 10 (1983) and Cycle 84 requalification programs. Tr. 32,961 (Leonard). He has averaged around 90 percent on his Cycle 84 weekly quizzes, consistent with his performance during Cycle 10. Id. As with Mr. Walsh, Mr. Leonard does not believe that Mr. Moore should have been removed from the program while

he was having difficulty passing his mock examinations. Id. We agree with Mr. Leonard that Mr. Moore's performance on the NRC licensing exam and in the recent requalification programs indicates that the judgment of the Licensee was not incorrect. Tr. 32,961-62 (Leonard).

155. UCS also questioned Mr. Ross about the competency of Mr. Moore. The reasons for Mr. Moore's difficulty with examinations, apparently, is that Mr. Moore tended to misread exam questions, i.e., he read "black instead of white" on exams. Tr. 32,631, 32,962 (Ross). However, Mr. Ross has absolutely no question about Mr. Moore's ability to follow directions while serving in the control room as an RO, he has absolutely no question about Mr. Moore's attitude or willingness to follow directions, and he considers Mr. Moore to be a competent operator. Tr. 32,962 (Ross). In short, Mr. Ross considers the problem to have been one of careless exam taking, not one of performance. See Tr. 32,963 (Mr. Moore reads into questions more than is there and goes off on tangents). Mr. Moore, he observes, is a "very intelligent individual" with knowledge that enables him to pursue tangents. Mr. Moore, he contends, actually "follows instructions quite well." Id.

156. In the case of Mr. Olive, UCS once again is challenging the judgment of Training and Operations in allowing

Mr. Olive to continue in the program. See Tr. 32,422-53, 32,963-68, 33,439-44 (Jordan cross-examination of Newton, Leonard, and Ross); UCS Tr. Exhs. 8-16, 27-28. UCS has argued generally that Mr. Olive's continued presence in the training program means that the Licensee has no criteria for removing an operator. We disagree. A chronological review of Mr. Olive's recent training history reveals an elaborate and progressive system established to deal with learning difficulties, including personally tailored programs and distinct possibilities of removal.

157. In March 1984, Mr. Olive passed his Cycle 10 requalification written exam; however, he failed his Cycle 10 oral exam. Tr. 32,963 (Leonard); UCS Tr. Exh. 16. In accordance with the requalification procedure, Mr. Olive was immediately removed from licensed operator duties. Tr. 32,964 (Leonard).

158. The operations supervisor who had conducted the oral exam documented weaknesses which Mr. Olive had shown during his oral, and those weaknesses were researched to determine what Mr. Olive had to review to improve his performance. The comments in the oral exam summary sheet provided the Training Department with a basis on which it could develop an upgrade program. An instructor in the training department developed an

upgrade self-study program detailing those specific topics in which Mr. Olive had shown weakness and materials to which he could refer. Id.

159. Mr. Leonard explained that in most cases (and in the case of Mr. Olive) with initial failures on oral or written exams, Licensee's approach is to design a self-study program which provides the operator with guidance on where to look for appropriate reference material to upgrade his knowledge level. Tr. 32,964-65 (Leonard).

160. Mr. Olive followed the self-study program. A reexamination was scheduled at a later date, and a board was reconvened for his reexamination. In April 1984, Mr. Olive failed his oral reexamination before the board. After reviewing the oral reexam results, the Training Department designed for Mr. Olive a more detailed and structured program than the original self-study. This individualized program consisted of requalification training lectures, checkouts on shift from SRO's, practice oral examinations, attendance at emergency director training, and a final oral board, which he had to pass. Tr. 32,965 (Leonard).

161. The final oral board was scheduled for July. Mr. Ross placed Mr. Olive under strict orders to complete the program, and assigned a supervisor to personally oversee

Mr. Olive. Personnel from Training also monitored the program. Mr. Leonard recollects that Mr. Olive completed his program in June, at which point he went up for reexamination. Mr. Olive passed his second reexam and was returned to licensed duties. Tr. 32,965-66 (Leonard).

162. Mr. Ross and Mr. Leonard discussed the results of the examination and believed that Mr. Olive's overall knowledge was satisfactory. Although they believed Mr. Olive had the knowledge required to perform licensed duties, they felt specific areas addressed on the board and revealed during requalification required further upgrading. The Training Department therefore developed an additional six-month upgrade program, including checkouts on systems and procedures. Tr. 32,966 (Leonard).

163. While working on his upgrade program, Mr. Olive has been accomplishing his shift foreman duties and completing his Cycle 84 requalification requirements. Tr. 32,967 (Leonard). Mr. Olive's recent grades on his Cycle 84 weekly tests -- 96.7, 86.7, 95.49, 97.5, 89.9, and 91.8 -- indicate that Mr. Olive has attacked his requalification and upgrade program with vigor. Tr. 32,967-68 (Leonard). Dismissing a UCS question about a possibly defeatist attitude, Mr. Ross emphasized that Mr. Olive has "continuously expressed a desire to

complete his duties and upgrade his knowledge." Tr. 33,444 (Ross). Mr. Ross has no hesitation about keeping Mr. Olive on as a member of his Operations Department. Tr. 32,968 (Ross).54/

164. Mr. Ross, who served on the two reexam boards, suggests that one reason for Mr. Olive's difficulties on his oral exams was that he was off-shift and therefore away from the control room and daily shift duties. Id. Also, Mr. Olive apparently had serious family-related concerns at the time of his oral exam difficulties. Id. We consider appropriate Mr. Ross' explanation as to why Licensee allowed Mr. Olive to take an oral reexam after his first failure: "I think anytime you have an employee, besides having the responsibility to provide qualified operators and safe operators, we also have a responsibility to the employee. This particular employee had an

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54/ UCS counsel may have had Mr. Olive in mind when he asked Mr. Ross whether he had ever recommended that a candidate or a licensed operator be removed from the training program on the basis of poor on-the-job performance notwithstanding good exam performance. See Tr. 32,592-93 (Jordan cross-examination of Ross). While the evidence introduced in this hearing indicates less than optimum performance, see UCS Tr. Exh. 9, it does not indicate inadequate on-the-job performance by Mr. Olive. The Board does not believe Mr. Olive's removal was necessary or even the best alternative available to respond to Mr. Olive's performance weaknesses. Furthermore, Licensee has removed the second most senior operator from licensed duties because of job performance (attendance) problems, even though the individual's training record was excellent. Tr. 33,063 (Ross).

extensive background in proven operation, and proven supervision. We felt he had some personal problems that perhaps intervened at this time and we felt he rated another chan[c]e." Tr. 32,449 (Ross).55/

165. The Board would like to make clear that, contrary to UCS' inference, the decision whether or not to remove someone from a training program is not lightly made. Mr. Ross has stated that he himself takes into account past performance in training, participation in shift activities, involvement in shift incidents (e.g., pump break due to operator error), general attitude of cooperation, and general knowledge level. Tr. 32,593 (Ross). Mr. Newton has testified that when he is deciding whether training should make a special effort for an individual, he considers the capability, aptitude, and effort demonstrated by the individual. Tr. 32,429-30 (Newton). The Board believes that the record on Messrs. Walsh, Moore, and Olive demonstrates the capability, aptitude, and effort not only of the trainees but of the Training and Operations Departments. UCS' exhibits themselves reflect the fact that not only

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55/ Mr. Ross pointed out that Mr. Olive had eight years of Navy nuclear power experience before joining GPU Nuclear as an AO. Tr. 32,450-51 (Ross). In the Navy, he served a full three-year term as a prototype instructor where, according to Mr. Ross, if any technical, personality, or supervisory problems had surfaced, he would have been discharged from that particular duty. Id.

is there management, but there is senior management involvement in Licensee's responses to training weaknesses experienced by operators. We conclude that the replacement and requalification programs have the mechanisms in place to discover performance weaknesses and to correct them.

c. Training Processes

166. The replacement and requalification training programs for licensed operators incorporate a number of complementary processes which have significantly changed since 1981 and which provide for the systematic development, administration, and assessment of the programs -- elements that ensure that the program is a valid means of teaching operators how to operate the plant safely. See, e.g., Regan, ff. Tr. 33,532.

i. Program Development

167. As previously described, Licensee utilizes the TSD model to construct, implement, and maintain GPU Nuclear's training programs. The experienced instructors in the Department have been introduced to the TSD system through a dedicated training session. The new instructors are indoctrinated as part of the initial instructor development course. Newton et al., ff. Tr. 32,409, at 29. This systematic approach to training, which Licensee has used albeit informally, since

mid-to-late 1980, emphasizes the use of behavioral learning objectives to match job needs and feedback from trainees and user group supervisory/management personnel. Id.

168. There is constant involvement by Operations management in the development and implementation of licensed operator training. Each of the program descriptions must be approved by the Manager, Plant Training, and Manager, Plant Operations, thereby further ensuring that training needs are met. Weekly quizzes for replacement and requalification programs are normally reviewed by the Supervisor, Licensed Operator Training, and are required to be approved by the Operator Training Manager. This provides for consistency between examinations, technical corrections, and concurrence with the established training program. Id. at 32. In addition, comprehensive examinations are submitted for approval to the Operator Training Manager and Manager, Plant Operations. This review and approval by subject-matter experts provides for technical validation of the examination. Id.

169. Each time the program is implemented, it reflects individual needs that have been identified through the operators and training and other management personnel. See, e.g., ¶ 198, infra. These table-top validation processes, although informal, help ensure that the content of the programs

reflects the training required to develop the knowledge and skills of each operator. Newton et al., ff. Tr. 32,409, at 32.

170. In addition to the regular training program content, certain circumstances call for implementation of special training programs. For example, major changes in plant procedures encompassing Once Through Steam Generator ("OTSG") Tube Rupture were implemented in conjunction with the repairs done to the OTSG's at TMI. These procedures reflected conclusions and recommendations contained in technical documents which were issued in conjunction with the repairs and which had an impact on the conduct of operations in the event of OTSG Tube Rupture conditions. The significance of these changes and the necessity that each operator be able to operate the plant safely under these conditions dictated that specific training be conducted. A joint effort between Operations, Training, and Technical Functions produced a training program which was conducted at the PSI simulator over a three-day period during the summer of 1983. The lesson plans, training objectives, and simulator drill guides were developed by Licensee personnel. Each licensed operator received three days of training, including both simulator and classroom. A written and operational test was administered at the end of each training program. Id. at 33; Tr. 32,855-56 (Ross).

171. The decision by Licensee to develop procedures based on B&W's Abnormal Transient Operating Guidelines ("ATOG") resulted in an additional and substantial effort by the company to incorporate the guidelines into the present procedural structure. Extensive man-hours were expended to revise plant procedures, and a training program was developed to enhance licensed operator knowledge and skills in support of the procedure change. Since ATOG emphasizes "symptom-oriented" rather than "event-oriented" response, the program was designed to include instruction in this area. The procedural revisions were submitted by a committee consisting of representives from Operations, Technical Functions, and Training. As changes were made, the committee identified topics that would require training. The Training Department used these topics and the revised procedures to develop a training program. A one-week training program for each crew was conducted at PSI in the first quarter of 1984, which consisted of classroom and simulator training. The lesson plans and drill guides for the training program were developed by Licensee personnel and forwarded to PSI for their use. At the completion of each week of training, each licensed operator took a written test and the crews had an operational exam. Most of the currently licensed operators have satisfactorily completed this special ATOG program; four new licensed operators and one recently SRO-licensed

Shift Technical Adviser have completed similar training (although not this specific program). Id. at 33-34, as modified at Tr. 32,407-08 (Newton).

172. The licensed operator training program effectively provides timely training requested by the Operations Department designed to resolve industry problems that are applicable to TMI. An example of this would be a fulfilled Training request for lectures on recovery from mispositioned control rods, which was a recent published industry problem. This responsiveness to current issues is of importance to the operators. Id. at 65; see ¶¶ 143-144, supra.

173. In addition to development of training programs requiring new knowledge and skills, Licensee has made provisions to address the general area of skill deterioration that can result from a prolonged shutdown. To support training needs in this area, two separate programs were initiated. Newton et al., ff. Tr. 32,409, at 34.

174. A restart qualification card, developed in 1983, has been designed to be utilized during hot functional testing, zero power testing, and the power escalation test program. The qualification card contains both individual and crew tasks which are to be completed, and is designed to provide each operator with exposure to specific operational situations.

Furthermore, the power escalation test program was designed with hold-time periods at 40% and 75% power levels to allow all crews the opportunity to participate in hands-on performance of items identified on the restart qualification card. Id. at 34-35.

175. Additionally, based on management's observation of crews during the 1984 ATOG simulator training, Licensee considered it beneficial for the crews to receive additional training on routine evolutions associated with operation at power. A special program was designed to incorporate lessons on startup, power operations, and licensee event reports. The lesson plans and drill guides developed by Licensee for these programs were used during a three-day simulator program in May and June of 1984. Each licensed operator was required to attend. At the end of the training period a written and operational test was administered. Id. at 35.

176. The method for control of the quality of the technical information available to Operations and Training personnel has undergone changes. All lesson plans used by the Operator Training section must be reviewed by Technical Functions to ensure that the information and scope of material being presented to the operators is technically correct. Id. at 35-36. A standard reference source document has been created

for use by Operations and Training personnel as a teaching and study aid. Id. at 36; Committee, ff. Tr. 31,749, at 18; Tr. 32,911-12 (Newton). The Operations Plant Manual ("OPM"), discussed supra, at ¶¶ 74 and 113, incorporates technical information from sources such as previous lesson plans, technical manuals, system design descriptions and operating characteristics, into one standard controlled document The OPM was drafted by GPU Nuclear personnel and reviewed by designated members of Operations, Training, and Technical Functions. The nine-volume manual contains one hundred twenty-one sections, only a few of which were still in the review process at the time of the hearings, and addresses areas such as primary and secondary systems, support systems, and plant fundamentals. Learning objectives, included in each section, have been written for RO's and SRO's. Periodic reviews are scheduled for each section and an owner is assigned to each section to ensure that it is updated to reflect plant conditions. See generally Tr. 33,080-82, 33,422-26 (Leonard, Ross). Every time an operating procedure is changed, consideration is given to changing the OPM as well and, as applicable, vice versa. Tr. 32,923-26 (Ross, Leonard). Because the OPM is controlled, it serves as a current source of technical information for licensed operators, licensed operator candidates, and training staff. See generally Tr. 32,908-11 (Leonard, Newton).

177. In summary, there are numerous mechanisms in place at TMI to ensure that the licensed operator training program is and will continue to be responsive to the needs of the operators, reflects current plant design, and constitutes a performance-based program.

ii. Training Delivery

178. Training delivery at TMI encompasses several different areas, including (1) an instructor development program, (2) an instructor qualification procedure, and (3) an instructor evaluation procedure. Newton et al., ff. Tr. 32,409, at 36-37.

179. Licensed operator instructors are required to attend the one-week instructor development program, which is under the direction of T&E's Educational Development Section.56/ The program includes an introduction to the TSD approach, curriculum development, development of behavioral

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56/ UCS makes the point that not all current instructors have completed the instructor development program. Tr. 32,483 (Leonard). The only one who has not attended this program, however, is Mr. Maag, who presently has an interim certification, provided for by the procedure, to teach operators. Id; see also, Tr. 32,216 (Long). UCS has presented no evidence that puts into doubt Mr. Maag's teaching abilities, and the reason Mr. Maag has not taken this program as yet is because of his fairly recent assignment to training. Tr. 32,216 (Long); Tr. 31,891-92 (Gardner, Uhrig).

learning objectives, preparation of lesson outlines and lesson plan formats, utilization of audio-visual aids, instructing techniques, preparation of exams, evaluation techniques and counseling techniques. Id. at 37; see ¶¶ 100-116, supra. In addition to initial instructor development and, of course, training necessary to maintain any current license, each instructor attends continuing instructor development training. The advanced instructor development program provides the instructor with additional skills not presented in the initial course. Advanced training has been provided to instructors in examination development, criterion-referenced instruction, audio-visual aids, and implementation of the TSD model. Newton et al., supra, at 37.

180. Each instructor also must be qualified in accordance with Training Department procedures. Licensed operator instructors are required to complete a qualification card related to their area of instruction. The qualification card specifies the proper level of technical knowledge necessary.57/ Included in the instructor qualification card is a list of

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57/ Instructors for plant fundamentals are required to be licensed operators or have specific educational background and experience. An NRC SRO license or instructor certification is required to instruct in plant systems and transients, integrated plant response and to function as a simulator instructor. Newton et al., ff. Tr. 32,409, at 38.

reading material which each instructor is required to read and discuss with his supervisor. The material includes the control of examination procedures, training program descriptions, 10 C.F.R. Part 55, and several documents describing the TMI cheating incidents. Prior to certifying instructors, the Manager, Plant Training discusses the cheating incidents with them, emphasizing lessons learned, including the responsibilities that each instructor has in ensuring the exam security process is maintained and taken seriously. Id. at 38.

181. A revision to the instructor career development path has resulted in precise specifications for each instructor position in the Training Department. The mode of progression for instructors now incorporates five separate promotional levels, whereas before there were only two available for licensed operator instructors. The instructor levels are based on experience, education, and accountability. This provides a more structured career path for instructors and a viable career path for Operations personnel. The revision is intended to encourage movement back and forth between Operations and Training. Id. at 38-39.

182. The classroom performance of each instructor is evaluated on an ongoing basis. An instructor evaluation procedure provides for evaluations of each instructor by upper

management and peers. Each instructor is scheduled to be regularly evaluated -- up to eight times per year -- when involved full-time in classroom instruction activities. Id. at 39; see Tr. 32,483-85 (Leonard, Newton). A detailed rating sheet has been developed that permits the evaluation of an instructor on a number of the important factors related to teaching, such as familiarity with technical information, adequate preparation and presentation of materials, establishment of sound learning objectives, selection of appropriate instructional methods, proper use of instructional aids, proper response to questions, classroom management, and instructor characteristics such as voice, diction, enthusiasm, and appearance. The evaluations are reviewed by the instructor, his supervisor, and Training management and entered into the instructor's qualification folder. These evaluations are used to upgrade the individual instructor's skills and identify and correct generic deficiencies. Newton et al., ff. Tr. 32,409, at 39; see also, Long & Coe, ff. Tr. 32,202, at 39-43, "The Criteria for and Development of TMI-1 Licensed Operator Instructors"; Committee, ff. Tr. 31,749, at 10-12; id., Special Report at 20-22.

iii. Exam Administration

183. Written examinations are part of Licensee's overall appraisal of a potential operator's competence to

function safely in the TMI-1 control room. Detailed guidelines are now used in constructing examinations.58/ The guidelines for exam construction apply to comprehensive examinations conducted at the completion of replacement and annual requalification training. The format and content of the examinations are designed to test specific skills and knowledges. The examinations are based upon behavioral learning objectives. Both informal job and task analyses done by the GPU Nuclear staff and a set of generic B&W task analyses constructed by INPO have been used, with a TMI-1 specific format analysis in progress as described earlier. Newton et al., ff. Tr. 32,409, at 40. The behavioral learning objectives for each specific lesson are developed by subject-matter experts when determining the material to be taught during each lesson. The subject-matter expert, in this case the instructor, conducts an informal job analysis to determine which knowledge and/or skills are required of the operator in the subject area being taught. Id. at 44.59/ In this manner, there is a direct link from the job

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58/ For a discussion of the exam security procedures implemented by Licensee, see ¶¶ 76-80, supra.

59/ Additionally, the objectives for requalification training are approved by the Manager, Plant Operations, while those for initial programs are derived from those in the Operations Plant Manual which has been reviewed by Operations, Training, and Technical Functions. From this the instructor formulates training objectives upon which the lesson plan and examination

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to the material taught to the examinations administered to the operators.

184. The guidelines for examination construction outline responsibilities in exam assembly, exam question coding, exam review and approval, and exam grading. Individuals are designated to fulfill responsibilities as exam writers, exam coordinators, and technical reviewers. Each has specific responsibilities to ensure that the examination reflects the behavioral learning objectives for the material being examined, contains technically correct information, and meets the specification required for the exam. Id. at 40-41.

185. A test specification is issued for each comprehensive examination prior to its construction. The specification details the breakdown of points among topic areas to be addressed in the examination, and the breakdown of point values to be addressed in each of the five skill/ability areas for each topic area. The five skill/ability areas which are used

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questions can be developed, if not already done. Approval of the examination includes a review to ensure that the questions reflect objectives presented for the lesson. Review by the Manager, Plant Operations, of the annual requalification examination and comprehensive examinations provides an additional validation process for these examinations. Newton, et al., ff. Tr. 32,409, at 44-45.

to code each question are 1) recall, 2) comprehension, 3) application of rules and principle, 4) analysis, and 5) synthesis. The test specification is determined by the Operator Training Manager, with input from the Supervisor, Licensed Operator Training. In determining the specification, the objectives used during the training program are utilized, thereby ensuring that the examinations contain the correct coverage in topic area (e.g., system or fundamental area) and the appropriate skills/abilities. Id. at 41.

186. UCS has tried unsuccessfully to find substantial holes in the exam writing, coordinating, reviewing, and approving process. See Tr. 32,491-504 (Jordan cross-examination of (Leonard). UCS makes the point that under the terms of the guidelines, a licensed operator is qualified to write exams. Tr. 32,497 (Leonard). Mr. Leonard has stated, however, that he controls the exam construction and designates the writers, and he never appoints operators outside the Training organization to write exams. Tr. 32,497 (Leonard). UCS apparently is concerned that a licensed operator will be the one responsible for determining the mix of skill and ability areas. Tr. 32,494-97 (Jordan cross-examination of Leonard). UCS' concern is unwarranted for two reasons. First, as Mr. Leonard has stated, UCS' strict reading of the guidelines is literally correct but practically of no consequence. Present practice prevents

operators from having the responsibilities UCS fears. Second, the comprehensive exam guidelines provide guidance on the subjects that should be covered, the kinds of questions that should be asked, and what key words indicate a certain skill or ability. See Tr. 32,494 (Leonard). Moreover, the exam writers do not make the final judgment about the skill and ability areas into which a certain percentage of questions should fall. Tr. 32,494 (Leonard). The exam writer makes an initial judgment about the design and mix of questions using the guidelines,60/ but the exam reviewer and Mr. Leonard, as the

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60/ An additional source for exam questions at TMI is the exam bank, which preserves questions from previous exams for possible use in later ones. Tr. 32,504 (Leonard). UCS has challenged the validity of the questions in the exam bank because Licensee does not periodically conduct a formal evaluation of each question in the exam bank. Tr. 32,504-06 (Leonard). We are satisfied, however, that a sufficient validation process does exist. First, the exam writer technically reviews the question when he decides to use it. Tr. 32,504-05 (Leonard). Second, the exam reviewer technically reviews the question to make sure it reflects plant conditions at the time of examination. Tr. 32,505 (Leonard). Third, by using the collusion review matrix, which, as discussed supra, at ¶ 79, lists the grade by each operator on each question, the Training Department sometimes can determine whether a question is valid. Tr. 32,505 (Leonard). Furthermore the Training Department has a number of means of ensuring that the instructor or reviewer has up-to-date information about the system in order competently to critique extractions from the exam bank: 1) the instructor or reviewer has the responsibility of referring to the OPM, which, as discussed supra, at ¶ 176, is continuously updated, for current information; 2) the licensed instructors stand two shifts a month in the plant to maintain proficiency; 3) the Operations engineering staff circulate summaries of new modifications to all crews, who then receive a briefing from their shift super-

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exam approver, make the final judgment. Tr. 32,495 (Leonard). In short, there is enough "quality assurance" built into the process to overcome the shortcomings of a hypothetical exam writer who is a licensed operator without training in examination construction.

187. Licensee does not code exam questions for difficulty. Tr. 32,506 (Leonard). UCS points to one recent requalification exam and finds in it a poorly-worded question which, UCS asserts, even counsel could answer. Tr. 32,525-26 (Jordan cross-examination of Leonard); see UCS Tr. Exh. 31, #6. Perhaps this illustration would not have existed if Licensee did code for difficulty or if the exam construction QA process had functioned perfectly. However, the illustration represents one question among innumerable exam questions, and there is no evidence suggesting that a lack of coding for difficulty has resulted in easy exams at TMI. Moreover, the question cited may be useful in at least reinforcing the definitions at issue.

188. UCS also has proposed that an excellent way of testing an operator's underlying understanding of the reactor

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visor; and 4) the Training Department places a copy of these summaries into a required reading file for instructors and into a lesson plan folder used for revising future curriculum. Tr. 32,908-09 (Leonard, Newton).

is to ask a question for which an operator would need three days to write a competent answer. See Tr. 32,511 (Jordan). UCS appears to disfavor the shorter essay questions utilized by Licensee. Notwithstanding UCS' preferences, its proposal is impractical. More fundamentally, UCS has failed to show any infirmity in the paragraph essay format preferred by Licensee. Moreover, during UCS' cross-examination of Licensee's witnesses, Messrs. Lecnard and Newton displayed a comfortable grasp of the kinds of questions that test specific knowledge of what is happening in the reactor. See, e.g., Tr. 32,506-13 (Leonard, Newton).

189. Operators are also evaluated through various oral examinations. The replacement training programs require that an oral exam be given at the completion of the programs and in addition, that final verification oral examinations be conducted at the completion of sections of the OJT program. These examinations encompass the tasks addressed in the section and are conducted by a shift foreman or shift supervisor. The OJT programs outline the knowledge level required for each of the tasks. Each examiner, a licensed SRO, uses the OJT task outlines to establish the content of the examination. Newton et al., ff. Tr. 32,409, at 45. In addition to the one-on-one comprehensive oral administered at the end of the replacement program, Mr. Ross normally conducts a separate oral on the

candidates. Tr. 32,535 (Ross). The Board is impressed by this further effort by Mr. Ross, which is beyond what the training department guidelines require. See id.

190. The oral examinations given as part of the licensed operator requalification program are comprehensive. See Tr. 32,532 (Leonard). The Operations and Training Departments jointly establish a list of topics to be addressed during the examination and issue it to assigned examiners. Licensed or certified SRO's conduct the oral examinations. The results are forwarded to the Supervisor, Licensed Operator Training, for review. The performance of operators on topics (pass/fail/marginal), as noted on the exam topic list, is reviewed for generic deficiencies in order to identify areas which may require training during the following requalification cycle. Newton et al., ff. Tr. 32,409, at 45-46.

191. UCS is correct that a review of the topic list summary sheet documenting an oral can only be administrative not substantive. Tr. 32,535-46 (Leonard). However, the Board finds nothing improper about relying on the oral examiner to judge an operator's performance on the oral exam. At some point, someone has to rely on the judgment of someone else. There is no other alternative, except having no orals, which we do not see as a preferable solution. The question, then, is

whether the people giving oral exams are the right people for the job. In this regard, UCS has directed all its critical attention to Mr. Ross, who may be the most proven of oral examiners. See ¶ 31, supra. UCS cites the fact that Mr. Ross has no formal training in the grading and administering of oral exams as reason for us to conclude that he is unqualified. UCS ignores the fact that Mr. Ross has been SRO-licensed on TMI-1 for about eleven years and has over twenty years of actual experience in giving oral exams. Tr. 32,601 (Ross); Newton et al., ff. Tr. 32,409, attached Ross statement of qualification. The Board simply does not accept that until Mr. Ross completes a formal course on oral exams, he is unqualified to take part in the process. Nor do we have any reason to challenge the tiered system used by Licensee by which orals are administered from more senior to the more junior licensed operators. See Tr. 32,539 (Ross).

192. Finally, UCS' witness, Dr. Regan, suggests that a small training program, such as the licensed operator training program, should rely only on standardized objective procedures and documents in place to prevent subjective influences from interfering with the evaluation of trainees. See Regan Surrebuttal, ff. Tr. 32,693, at 8. Dr. Regan apparently believes that subjective judgments are inherently flawed and should therefore be expunged from all evaluations of a

trainee's performance. See, e.g., Regan, ff. Tr. 33,532, at 12, 15-16. Hence, to Dr. Regan, oral examinations and walk-through exams are of very little value so long as effective simulator training is in place. Id. at 15-16; Tr. 32,828-31, 32,839 (Regan). Moreover, Dr. Regan testified that personal evaluations of operators' job and training performance by their superiors or peers is the least reliable mode of evaluation available. Regan, ff. Tr. 33,532, at 12.

193. The OARP Review Committee agrees with Dr. Regan that the documentation and standardization of evaluation procedures can be useful. However, the Committee disagreed with Dr. Regan's low opinion of the value of the personal evaluations of operators performed by training managers and on-the-job managers. Committee Rebuttal, ff. Tr. 33,320, at 15. The Committee testified that it would be unnecessary and counterproductive to require these managers to spend a considerable amount of time engaged in the administrative task of documenting all of their activities and interactions with the operators or trainees in light of their extensive first-hand appreciation of the strengths and weaknesses of the operators which frequently transcends information obtained from predetermined formal questionnaires and checklists. These first-hand impressions are especially valuable in a relatively small, stable program such as the TMI-1 licensed operator training program

where the Training and Operations managers are very familiar with the trainees' backgrounds and performance. Id. at 15-16. Training and Operations managers are privy to and continuously review operators' on-the-job, classroom, simulator (BPT and B&W) and test (written and oral) performance. Id. at 16. The composite of this information, which constitutes a picture of each individual's strengths and weaknesses, is continuously reviewed by Training and Operations. Group or team performance is also evaluated. From this composite, the Committee concludes the managers have a sound, although not necessarily standardized, basis on which to judge performance. Id.

194. The Board agrees with the OARP Review Committee's positive assessment of the value of subjective evaluations. Such evaluations may be inherently subject to an evaluator's idiosyncracies. However, we believe that they also are extremely useful in providing insightful information about individuals' capabilities and weaknesses.

iv. Program Evaluation and Feedback

195. In the licensed operator training programs, there are a number of mechanisms established to provide Training and Operations management with an evaluation of the effectiveness of the training programs. These mechanisms include examinations, periodic internal evaluations, external

evaluations, and feedback from operations personnel. Newton et al., ff. Tr. 32,409, at 46.

196. Examinations. As is already evident, through its various exam processes, Licensee not only evaluates its operators, but it assesses the adequacy of its licensed operator programs. Simulator operational examinations are utilized to assess the performance of individuals and groups receiving training. When the NRC announced that it would no longer conduct simulator exams for utilities that did not have replica simulators, GPU Nuclear considered the practice beneficial as a means of evaluating the effectiveness of the program and candidates' qualifications and, accordingly, continued the practice on its own. The NRC, in fact, ultimately decided to continue administering simulator exams for TMI-1. Id. at 46-47.

197. The examinations conducted by both Licensee and the NRC are evaluated to identify both individual and generic weaknesses. These are used as input into future changes of program content and/or description. The results of oral and written examinations are also evaluated to identify weaknesses that may exist in the training program or in individuals. Oral exam summary sheets and written comprehensive exam result matrices are reviewed by the Supervisor, Licensed Operator Training, in order to determine if additional training is

required or changes are needed in program content. Commonly missed questions can be easily identified and corrective action can be initiated where required. Determining if the programs' training objectives have been mastered through application to plant operations is valuable in assessing whether training is meeting its objectives. Id. at 47.

198. Internal Evaluation. Periodic internal evaluations provide an additional means by which programs can be validated. Each of the licensed operator programs requires that an annual audit be conducted. The team conducting the audit is made up of Operations and Training personnel. The team assesses the adequacy of the program for meeting new requirements, adequacy of records, quality of material and presentations, and program effectiveness. In conducting the review, the team may incorporate input from NRC inspectors, Quality Assurance audits, regulatory changes, industry experience, license candidate critiques and other audits conducted during the year. The team reports its results to the Manager, Plant Training, and Manager, Plant Operations. During 1983 a review of operator training programs was conducted by the Operating Training Review Committee. The membership of this team included the Manager, Plant Operations, Operator Training Manager, Training Coordinator, Supervisor, Licensed Operator Training, a shift foreman, one instructor, and one licensed control room

operator. The review team conducted an in-depth review of the RO and SRO replacement programs and the licensed operator requalification programs. Individual team members solicited input from both the Operations and Training Departments in the following areas: informal job analysis of each licensed position to ensure that training program content adequately prepares candidates through OJT, classroom, and simulator training; method of training delivery; operations/training communications; technical content of the program; and administration of training programs. Id. at 48-49.61/

61/ The following changes in licensed operator training programs that were effected as a result of the Operator Training Review Team Final Report:

(1) Licensed operator replacement programs are scheduled based on a five-year plan developed by TMI-1 Operations. Class start dates are published for a five-year period. Variations are communicated to training several months in advance;

(2) The number of qualified licensed operator instructors has increased;

(3) A revision of the CRO OJT program has been made to include guidance on performance levels for tasks;

(4) The RO replacement program was revised to include additional tasks for direct hires;

(5) The RO and SRO replacement OJT programs were reviewed to reflect recent procedural changes;

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199. In May 1984 the Training Department conducted a self-evaluation of its licensed operator programs. This evaluation was completed in accordance with criteria established by INPO. Information gained from this self-evaluation will provide input into decisions on changes in program content, process, and records. Id. at 50.

200. External Evaluation. The TMI-1 licensed operator program has been evaluated repeatedly by persons or organizations outside its structure. These evaluations were completed both in response to requests by Licensee and as a result of GPU Nuclear's membership in INPO. These evaluations include those conducted by Data Design Laboratories (DDL), INPO, Admiral Hyman G. Rickover, and the Reconstituted OARP Review Committee. Id.

201. In September, 1982, DDL issued a report titled "Assessment of Selected TMI-1 Training Programs." Licensee

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(6) Additional tasks were added to the senior reactor operator OJT program; and

(7) The control room mockup was delivered and is being used for classroom instruction and study.

Newton et al., ff. Tr. 32,409, at 49.

contracted with DDL in June 1982 to conduct an independent assessment of selected TMI-1 training programs, including operator training programs. The scope of the evaluation included (1) a review of the technical content of the licensed operator training programs and a comparison with INPO guidelines, (2) the administration and delivery of the training programs, and (3) an assessment of the results of the training program. The intent of the DDL report was "to provide informed, broadly experienced recommendations and guidance for the further enhancement of efforts which have been well started by GPU Nuclear." In response to the DDL recommendations, GPU Nuclear established an action item tracking system with tracking responsibility at corporate offices. An individual was assigned to respond to each finding and take appropriate corrective action. The status of the action items is updated on a regular basis. Id. at 50-51.

202. In 1982 and 1983 INPO conducted evaluations of TMI-1 site activities to make an overall determination of plant safety, to evaluate management systems and controls, and to identify areas needing improvement. As a part of these evaluations INPO examined licensed operator training. Recommendations for improvement were entered into an action item tracking system and individuals were assigned to respond to each and initiate required corrective action. The items are updated on a

periodic basis. Although recommendations were made regarding improvements in the programs, the 1983 evaluation reported the following:

(1) TMI-1 "is being effectively maintained by qualified personnel;"

(2) "There is a well defined program focused on operational planning and preparation for startup, including the startup qualification program;" and

(3) "Station personnel are well qualified. Their morale, positive attitude, and motivation reflect commitment to improved performance."

Id. at 51. "Station Personnel" includes licensed operators. Tr. 32,676-77 (Leonard).

203. In anticipation of operation of TMI-1 in 1983, an assessment of the management at TMI-1 and its qualifications to operate nuclear power plants was conducted by a team led by Admiral Hyman G. Rickover. Admiral Rickover's final report, titled "An Assessment of the GPU Nuclear Corporation, Organization, and Senior Management and Its Competence to Operate TMI-1" was issued on November 19, 1983. The report encompassed the area of licensed operator training. As with previous external reports, findings were tracked at the corporate level. The following findings relating to operator training were documented in the report:

(1) "present training exceeds regulatory requirements in breadth, depth and diversity of personnel training;" and

(2) management involvement in training is "refreshing."

Id. at 51-52. In the section of the report entitled "The Importance of Training," Admiral Rickover endorsed training management. Committee, ff. Tr. 31,749, Special Report at 11-12.

204. On April 19, 1984, a follow-up report was issued by Admiral Rickover which centered on actions which had been taken by Licensee management in implementing recommendations from the previous assessment. The conclusion, as stated in the report, was that the "actions of GPU Nuclear Corporation management give further evidence of the competence to safely restart and operate the plant." Id. at 52.

205. Aside from the independent assessments contracted by Licensee, assessments have been conducted by the NRC. Two of the evaluations conducted recently by the NRC are its Systematic Assessment of Licensee Performance ("SALP") dated April 24, 1984, and an Operational Readiness Evaluation ("ORE") (Inspection No. 50-289/84-05) dated April 13, 1984. Id.

206. The purpose of the SALP with regard to licensed operator training was to provide valid indications of the adequacy and effectiveness of training of personnel. Id. at 53.62/

62/ The following observations were made in the report:

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207. The ORE was specifically oriented toward obtaining an improved understanding of the state of knowledge and readiness of NRC licensed personnel at TMI-1. Based on the results of the evaluation, licensed personnel at TMI-1 were found by the NRC to be "knowledgeable and well trained." The results also indicated "an effective requalification program" and "a sound and effective training approach." Id. at 53-54.63/

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(1) "A large number of dedicated training personnel, detailed procedures specialized manuals, technical courses, and well maintained and retrievable records reflect a high degree of management attention to implementation of the training program."

(2) "Control procedures established last year in response to ASLB Partial Initial Decision on the Reopened Proceeding on cheating were well thought out and properly implemented."

(3) "Interfacing between the plant staff and the training staff is evident with frequent feedback of practical information into the training program."

(4) "Personnel training on numerous restart modifications was found to be generally well developed, timely and supplemented by training briefs prepared and presented by the Operations Department. These briefs were initiated by the Licensee and demonstrated a desire to ensure the plant staff's knowledge of the numerous restart modifications."

Newton et al., ff. Tr. 32,409, at 53.

63/ Measures to compensate for any decline in operational skills have been integrated into the requalification program,

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208. Feedback. As previously described, by allowing operators to have a voice in their training, the program is improved and operators are less likely to become disgruntled or frustrated by the training in which they must participate. Meetings at the completion of each requalification training week have been instituted at which operating personnel from that week's training class, the Training Supervisors, the Training Coordinator, and, when possible, the upcoming week's Shift Supervisor who is scheduled for training discuss the previous week's training, focusing on corrections that should be made for the next week. Id. at 64. Also, off-shift tours and management evaluations of instructor performance are fed back into the system to improve the program.

d. INPO Accreditation

209. Licensee presently is seeking accreditation by INPO of its licensed operator training programs.64/ The purpose of the INPO accreditation process is to assist member

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and have been addressed in classroom and simulator training. Id. at 53-54; see ¶¶ 140-142, supra.

64/ Licensee also has sought INPO accreditation for its TMI-1 non-licensed (auxiliary) operator, shift technical advisor and radiological controls technician training programs. Newton et al., ff. Tr. 32,409, at 67-68.

utilities in developing training programs that will provide well-qualified, competent personnel who will operate their nuclear power plants with quality and excellence. To obtain accreditation, a utility must demonstrate that its training meets the INPO accreditation criteria. Newton et al., supra, ff. Tr. 32,409, at 65-66.65/ The INPO accreditation process itself consists of three major parts: (1) Accreditation self-evaluation conducted by the utility and resulting in a self-evaluation report submitted to INPO in a prescribed format;66/ (2) Accreditation team evaluation conducted by peer evaluators from INPO and other utilities and resulting in an accreditation team report;67/ and (3) Accreditation decision by the INPO

65/ Dr. Kimel, who is an alternate member of the INPO accreditation board, testified that seven utilities have received INPO accreditation of specified training programs. Tr. 32,048-49 (Kimel).

66/ The self-evaluation is conducted based on the INPO accreditation criteria and a comparison of the utility's training programs to training and qualification guidelines issued by INPO for these specific programs. Newton et al., ff. Tr. 32,409, at 66.

67/ The accreditation team is composed of a group of peers with collective expertise in nuclear power plant operations, nuclear utility training, instructional processes, and training evaluation. During the visit, the team interviews training and other personnel; observes training activities, examines facilities, equipment, and training materials; reviews instructor qualification procedures; and examines training program content and training records. It reviews the conclusions of the Self-Evaluation Report and provides an independent check on its thoroughness, and evaluates how well the training programs meet

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Accrediting Board.68/ Id. at 66-67.

210. The Training Department has completed its self-evaluation report in support of INPO accreditation. An INPO accreditation team visited the site in early October, 1984 and has prepared its report. Knief & Leonard, ff. Tr. 33,364, at 11; see letter from counsel for Licensee to Appeal Board, December 19, 1984. The accreditation, if received, will be for a period of four years, requiring an interim two-year review and update. It is the goal of Training and Education to maintain the accreditation of its programs. Long & Coe, ff. Tr. 32,202, at 43.

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the related INPO accreditation criteria and compare against the state of the art. The team prepares its conclusions and recommendations and writes a report that is provided to the utility. The utility submits a written response to the report providing clarification or describing any corrective actions taken, if required. The accreditation team report and the utility's response are submitted in a joint report to the INPO Accrediting Board. Id. at 67.

68/ The Accrediting Board consists of five members: two persons from INPO member utilities, one person from a non-nuclear industrial training organization, one person from the post-secondary education community, and one person recommended by the NRC. Alternate members are selected to facilitate the scheduling of meetings. No two individuals are affiliated with the same organization. The Chairman, who normally remains in office for two years, and the other members and alternates are approved by the President of INPO. Id. at 66-67.

211. INPO has established criteria for assessing training which address the program (content and trainee evaluation and qualification methods), the process (organization and administration, resources and facilities, and program development and implementation), and the training staff (size and workload, qualification, and development and evaluation). Newton et al., ff. Tr. 32,409, at 66. INPO accreditation of the TMI-1 licensed operator training program would constitute a well-recognized imprimatur of a high quality program.

e. Operator Attitudes Toward Program

212. It is unclear whether operator attitude towards training constitutes valid evidence of the quality of the program. As Dr. Regan pointed out, students' views of their instructors may indicate the students' enjoyment of the class, but not necessarily their retention of necessary knowledge. Tr. 33,773 (Regan). Nevertheless, the Appeal Board expressed a concern about operators' views of and, particularly, respect for the program, see ALAB-772, supra, 19 N.R.C. at 1233, the parties focused on the issue and, we, in turn, summarize our findings based on the evidence presented.

213. Based on Mr. Ross's daily contacts with the licensed operators, it is his judgment that the current TMI-1 licensed operators accept and have a positive attitude about

the licensed operator training program. He attributes this to the maturing of the program and the efforts that have been made by GPU Nuclear to provide operators with the opportunity for input into the program's development. Newton et al., ff. Tr. 32,409, at 60.

214. UCS faults Mr. Ross for not conducting specific formal interviews for the purpose of ascertaining operator attitudes. See Tr. 32,562-63 (Jordan cross-examination of Ross). However, as Mr. Ross explained to UCS, such formality is not necessary in his case:

> I talk to the operators often. I am not a guy they don't see. They see me every single day. I attend training myself. I sit in training class. I am in the tra[i]ning facility often. I am in the control room often. I ask them about their training. I look at their scores. So, I have a lot of interface in that area[ ], and what I get is real good from them.

Tr. 32,562 (Ross).69/

215. Perhaps the most conspicuous evidence of operators' acceptance of the training program and the demands it makes on them is their steady improvement on weekly quizzes and on requalification examinations. Mr. Ross believes that this

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69/ Mr. Ross was the only licensed operator who testified before the Board. Although UCS originally subpoenaed four operators to testify, it subsequently withdrew that request.

improvement reflects a more positive approach to participation in the program. He bases his view not only on his own observations, but also on the feedback Operations and Training management have received. Newton et al., ff. Tr. 32,409, at 60-61.70/

216. GPU Nuclear has instituted changes designed in part to improve operator attitude and to establish better communications between operators and their management. As previously discussed, the Vice President of TMI-1, Mr Hukill, interviews all licensed operator candidates prior to their license certification (or recertification). At a minimum, each licensed operator is interviewed by Mr. Hukill annually. See ¶ 67, supra. Mr. Hukill encourages the operators to express their concerns, such as criticisms of the training they receive, and informs the operators that such concerns will be

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70/ UCS contends that grades may have improved, but attributes this to improvements in the training program, not to operator attitudes. See Tr. 32,559 (Jordan cross-examination of Ross). UCS then faults Licensee for not conducting any interviews or psychological evaluations to determine precisely what caused improved grades. See Tr. 32,560 (Jordan cross-examination of Ross). The problem the Board has with this argument is that it flies in the face of the rest of UCS' position, namely that the training program is inadequate. Mr. Ross states that his experience has been that the more interested one is in something, the harder one tries and the better the result. Tr. 32,559 (Ross). We agree. The better results do tend to confirm Mr. Ross' impressions of positive operator attitude towards training.

evaluated and, as appropriate, action taken to resolve them. This process makes the Vice President accessible to operators, and ensures an open communications link between senior management and the operators. The process tends to improve operator morale and attitude about their work, generally, including training. Newton, et al., ff. Tr. 32,409, at 61.

217. Visibility of management in the training center is a positive ingredient in ensuring a good training program and helps to demonstrate to the operators the importance placed on training by their management. Various senior managers attend training, including periodic attendance by Mr. Hukill. Mr. Ross personally attends training in the status of a student. Mr. Ross schedules his training such that he participates in training with different crews throughout the training cycles. While this exposure improves his knowledge as an operator, it also keeps him abreast of the feelings of the operators. Additionally, he is able to observe first-hand the conduct of training and the reactions of Operations personnel to the program. Id. at 61-62.

218. During simulator training, management's interest in the quality of training and the development of proper control room skills is demonstrated by the attendance of all Emergency Directors and various other GPU management level

personnel. An operational examination is administered by one of the Emergency Directors to each requalification crew during simulator training periods. This process not only improves and verifies operator skills but, in Mr. Ross's view, it also positively affects operators' views about the importance of their training and management's interest in continually improving it. Similarly, management's participation in simulator classroom training allows early detection of training problems or operators' concerns and ensures that the proper material is being taught and tested. Id. at 62.71/

219. Mr. Ross himself states that it is both inevitable and appropriate that operators, Mr. Ross included, will have some negative comments about the training program. Mr. Ross, however, is of the view, which he believes the TMI-1 operators share, that the licensed operator training program is of high quality and is accepted by the licensed operators. He asserts that the operators understand not only that training is a job function, but that it is their responsibility to be committed to participating in training in order to properly

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71/ Mr. Ross personally attends simulator training and administers operating examinations to new trainees and experienced requalification crews. In the past several years, he has observed a sincere desire on the part of the operators to better their operating skills and a highly professional and serious approach to this type of training. Newton et al., ff. Tr. 32,409, at 63.

discharge their licensed duties. He believes Operations is working jointly with the Training Department continually to improve the program and to maintain the high standards now established in the licensed operator training program. Newton et al., ff. Tr. 32,409, at 65.

220. These conclusions by Mr. Ross are responsive to the RHR Report,72/ which UCS has introduced into the record in its entirety. The RHR Report summarizes the findings of psychologists hired by Licensee to survey operator attitudes in 1982, after the issuance of the Special Master's Report and the 1982 Licensing Board decision on cheating. See Tr. 32,038-40 (Gardner, Kelly). After the events which led to these decisions, Licensee legitimately was concerned about the morale and attitudes of its operators. See LBP-82-56, surpa, 16 N.R.C. at 301, 337,383 (¶¶ 2088, 2240, 2416-17). The RHR Report was designed to elicit operators' feelings about subjects of interest to them. See Tr. 32,038-39, 33,293 (Gardner). Obviously, it was not designed to eliminate "invalid" feelings. See ALAB-738, 18 N.R.C. 177, 198 (1983) (RHR report is "one-sided").73/

72/ See UCS Tr. Exh. 6, "Priority Concerns of Licensed Nuclear Operators at TMI and Oyster Creek and Suggested Actions Steps," March 15, 1983, by Dr. Paul F. D'Arcy and Dr. John R. Sauer, of Rohrer, Hibler and Replogle, Inc. ("RHR Report").

73/ UCS cross-examined Mr. Ross at some length about his reaction to the RHR Report and its raw data, UCS Tr. Ex. 7. See

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221. The RHR Report reflects both negative and positive feelings by operators towards their job, including training.74/ From it, the Board cannot reach any clear

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Tr. 32,563-89 (UCS cross-examination of Mr. Ross). UCS faults Mr. Ross for not following up on a number of apparently negative statistics in the Report. See, e.g., Tr. 32,566-69 (Jordan cross-examination of Ross); but see n.74. In response, Mr. Ross stated that he believed that he had a first-hand appreciation of the operator attitudes reflected in the RHR Report, and he knew what the problems were. Tr. 32,5661-72 (Ross). Given the extensive company effort responsive to RHR, of which Mr. Ross obviously was aware, see Tr. 32,589 (Ross), we do not fault Mr. Ross for not embarking on an independent formal process to respond to the RHR Report's findings.

74/ For example, on the one hand, 36% of the TMI candidate and licensed operators surveyed disagreed that top management is more concerned about public safety than it is about generating electricity; 24% of the operators felt that there are so many cumbersome procedures that in practice the GPU Nuclear policy on compliance is disregarded; 48% felt that the overall quality of the training staff is poor; 79% felt that the training department is not oriented to the needs of the operators; 14% did not feel that training has been improving; and 73% did not feel that training prepares them for what they actually do as operators. See UCS Tr. Exh. 6 (RHR Report), questions 22, 23, 24, 29, 102, and 132; see also, Tr. 32,565-80 (Jordan, Ross).

On the other hand, all of the operators surveyed felt the licensing process is necessary; 84% felt that they learned useful material while preparing for their requalification exam; 79% felt that the content of the last requalification exam was job relevant; 78% felt that the training and testing programs have helped them be a more effective operator; 91% thought Licensee has a major commitment to training; 86% felt training has been improving; 95% were or would be proud to be licensed operators; 86% felt it was worth the effort and demands on them to be a licensed operator; 86% thought that their present morale was good; all of the surveyed operators stated that they

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judgment about operator attitude towards training, even in the 1982 timeframe. Dr. Gardner, who is an educational psychologist, emphasizes that RHR is one data point in a continuum, beginning with the original OARP Report findings and culminating in the Committee's recent interviews of operators, described below. See Tr. 33,293-94 (Gardner); see also Tr. 32,745-46 (Regan). Furthermore, the Staff testified that there were serious infirmities in the Report, e.g., the questionnaire used and the Report itself contain a number of ambiguities. Tr. 33,206, 33,216 (Morrisseau); see also ALAB-738, supra, 18 N.R.C. at 198. Finally, Licensee has responded very thoroughly to the action items contained in the RHR Report. Licensee Tr. Exh. 1; see also Tr. 32,313-17, 32,347-49 (Long). The Board is satisfied that even if RHR did provide evidence at one time of some poor attitudes toward training--which we do not find--there is no reason to believe those views still exist at TMI, nor could we ask Licensee to do more about the RHR Report

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were committed to quality performance; 93% had confidence in the plant management; 93% disagreed that safety got too high a priority at TMI-1; 98% felt that they understood their job responsibilities and that these responsibilities had been made clear to them; and 86% felt that they had management support in helping to do their job. See UCS Exh. 6 (RHR Report), questions 1, 14, 17, 18, 19, 29, 50, 51, 55, 66, 115, 134, 135 and 138. It is not surprising that Mr. Ross felt that the Report was "very good and very positive about TMI." Tr. 32,573 (Ross).

findings than it has already done.75/

222. The OARP Review Committee has testified to the current attitudes of the operators. Members of the OARP Committee observed TMI-1 operators and candidates in the control room, in the classroom and at the B&W simulator. Committee members had the opportunity individually to discuss training with operators (including the six shift supervisors) either in the TMI training facility or in the plant. See ¶ 245, infra. The Committee also was aware of the various processes and procedures in place to ensure that operator views and criticisms of training are aired, responses provided, and appropriate actions implemented. It was the Committee's impression, based on the observations and assessments it made, that the operators recognize the value and have respect for the licensed operator training program, recognize and accept their responsibility as licensed operators to participate in the program, and believe that it is an effective program. Committee, ff. Tr. 31,749, at 31. To the extent operator attitude is relevant at all, the Board believes the Committee's findings, which are very recent, are the most pertinent. Notwithstanding the absence of a

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75/ One indication of good overall morale at TMI is the low operator attrition rate. According to Mr. Ross, the Operations Department has not lost an operator in years. Tr. 32,939 (Ross).

formal questionnaire, as discussed below, the Committee's findings are well-supported by the experience of the interviewers, the process used, and the number of operators interviewed. See ¶¶ 224-257, 286-290, infra.

5. Summary and Conclusions

223. In this section, the Board has considered in detail the TMI-1 licensed operator training program and how it is implemented at TMI. We have evaluated the management, staff and facilities available to support the program. We have considered in great detail post-cheating modifications to the program, and operators' views of it. It is the Board's judgment that licensed operator training program at TMI-1 is an effective performance-based training program. We believe that GPU Nuclear has developed sound procedures to implement the program consistently and reliably, and that the INPO accreditation effort is commendable.

B. The Reconstituted OARP Review Committee's Assessment of the TMI-1 Licensed Operator Training Program

1. The Reconstituted OARP Review Committee

224. The Reconstituted OARP Review Committee testified at great length about its review of the current TMI-1 licensed operator training program. The members of the Committee are quite familiar to us as are their distinguished credentials. See nn.2 and 9, supra.76/ In summary, Dr. Robert E. Uhrig is Chairman of the Committee and Vice President, Advanced Systems & Technology for Florida Power & Light Company, Miami, Florida, with 28 years of utility and engineering education experience. Dr. Julien M. Christensen is Chief Scientist, Human Factors and Logistics for Universal Energy Systems, Dayton, Ohio and a leading expert in human factors engineering. Dr. Eric F. Gardner is Professor Emeritus of Psychology and Education, Syracuse University, Syracuse, New York and a well-known educational psychologist. Dr. William R. Kimel is Dean of the College of Engineering at the University of Missouri, Columbia, Missouri and, inter alia, has served as President (1978-1979) of the American Nuclear Society. See Committee, ff. Tr. 31,749, resumes. Dr. Kimel has been affiliated with INPO

76/ Dr. Regan testified that he knew Dr. Christensen professionally as a highly competent psychologist and he knew Dr. Gardner by reputation. Tr. 32,695-96 (Regan).

virtually since its inception. He is currently serving as an alternate member of the INPO Accrediting Board. Tr. 32,046 (Kimel). Mr. Frank Kelly is President of PQS Corporation and former Chief of the Operator Licensing Branch of the AEC.77/ See ALAB-772, supra, 19 N.R.C. at 1210. Each of the Committee members brought with him valuable expertise from various disciplines which greatly enhanced the Committee's ability to review the TMI-1 training program effectively. As the Appeal Board found in ALAB-772, "the OARP Review Committee [was] comprised of exceptionally well-qualified persons from a range of disciplines (nuclear engineering, education, psychology, testing) most suitable to their task." 19 N.R.C. at 1211; see also LBP-82-56, supra, 16 N.R.C. at 378 (¶ 2397). The Reconstituted OARP Review Committee is equally well suited to review the current TMI-1 licensed operator training program and to address the remanded training issues.

225. Our satisfaction with the qualifications of the members of the Reconstituted OARP Review Committee notwithstanding, a discussion of the methodology employed by the Committee in reviewing the TMI-1 licensed operator training program and the remanded training issues is warranted to address

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77/ As previously discussed, Mr. Kelly replaced Mr. Richard J. Marzec, Manager of Technical Training for Duke Power Company, due to Mr. Marzec's unavailability. See n.9, supra.

the numerous concerns raised by the NRC Staff and UCS. In Section III.C of ALAB-772, the Appeal Board indicated that the Board should have sought further testimony from the Committee concerning its view of the training program in light of the cheating incidents and related program deficiencies. See ALAB-772, supra, 19 N.R.C. at 1233-36. The Committee interpreted the mandate of the Appeal Board as calling for it to conduct a review of the training program sufficient to allow it to knowledgeably address the remanded training issues. The Committee did not believe that, in seeking its opinion, the Appeal Board intended for the Committee to "validate" or perform a quality assurance check on the licensed operator training program. See Committee Rebuttal, ff. Tr. 33,320, at 9. Nonetheless, the Committee's testimony indicates that it did perform a comprehensive review of the current training program that rivals the level of review an accreditation team would perform. Tr. 32,109 (Kimel).

226. We agree with the Committee's assessment of the Appeal Board's intent. We do not believe that the Appeal Board intended for the Committee to undertake an accreditation-type review of the training program in order to address the remanded issues.78/ See Tr. 33,249-51 (Staff view that Committee

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78/ Our review of the testimony revealed that the Staff and UCS believe that the Committee should have performed an

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members' credentials greatly exceed those of INPO staff workers who conduct accreditation-type review). Rather, we are confident that the Appeal Board intended the Committee's review to have been fashioned such that the Committee could provide us with knowledgeable and competent testimony regarding its opinion of the adequacy of the training program in light of the remanded issues. Hence, the threshold question is whether the Committee's method of review was sufficient to allow it to knowledgeably address the remanded issues.

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accreditation-type review of the training program. The Staff argued that the appropriate methodology should be structured like that performed by Data-Design Laboratories in preparation of the DDL Report (a multi-volume accreditation of the TMI-1 training program exceeding 300 pages in length). Staff, ff. Tr. 33,148 at 36; Tr. 33,246-48 (Persensky, Buzy). The UCS methodology is also on par with an accreditation-type review in terms of the depth and breadth of the review as evidenced by Dr. Regan's statement that it would take a team of five qualified people three months to complete his recommended review. Regan, ff. Tr. 33,532 at 22. Hence, notwithstanding the testimony of Mr. Persensky that neither the DDL approach nor the Staff's methodology are technically accreditation methodologies, our review of the methodologies presented by the Staff and UCS indicates that they clearly suggest that the Committee should have conducted an accreditation-type review to appropriately address the remanded issues. See Tr. 33,249, 33,273-74 (Persensky).

2. The Committee's Methodology

a. Committee's Initial Review (May-June 1984)

227. The Reconstituted OARP Review Committee met for two intensive three-day sessions at the end of May and in early June of 1984, first at TMI and then in Parsippany, in order to review with knowledgeable GPU Nuclear personnel the current status of the TMI-1 licensed operator training program.79/ Committee, ff. Tr. 31,749, at 4. In addition to these sessions, the members of the Committee continued to review the training program during the days between and the weeks following these sessions. See Tr. 31,798-801 (Uhrig, Kelly, Gardner); Tr. 31,807-14 (Uhrig, Kimel, Christensen, Kelly, Gardner). The Committee's findings, based upon this initial review of the TMI-1 licensed operator training program, are summarized in their Special Report.

228. We received extensive testimony from the Committee regarding their efforts in reviewing the TMI-1 licensed operator training program. The Committee initially convened at

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79/ Dr. Kimel was unable to be present during the initial session; he subsequently visited TMI for an individual briefing. Dr. Uhrig was unavailable for one day; however, he spent three additional days in Parsippany drafting the first revision of the Special Report and subsequently coordinated the editing of the final draft of the Special Report. Committee, ff. Tr. 31,749, at 4.

TMI from May 30 to June 1, 1984 at the request of GPU Nuclear to respond to the training issues raised by the Appeal Board. Committee, ff. Tr. 31,749 at 3; Tr. 31,789 (Uhrig). During that period, the Committee was briefed extensively about the licensed operator training program by members of the Training and Education Department staff. Tr. 31,793 (Uhrig). These briefings covered various topics ranging from the establishment of procedures to keep the replica simulator up to date with future plant changes, Tr. 33,277 (Christensen), and GPU Nuclear's efforts regarding INPO's accreditation of the TMI-1 training program including a discussion of the TMI-1 Self-Evaluation Report ("SER") submitted to INPO, Tr. 32,044-45 (Gardner), and the development of TMI-specific job/task analyses based upon the INPO job/task analysis. Tr. 33,324-25 (Christensen). Approximately one-third to one-half of the Committee's time at TMI was spent in briefing sessions with GPU Nuclear personnel. Tr. 31,794 (Uhrig). The briefings were structured such that GPU Nuclear staff members were available to answer any questions that the Committee had regarding the training program. This allowed the Committee to assimilate efficiently a great deal of information. See Tr. 32,023-24 (Gardner).80/

80/ In the course of its subsequent work, see discussion infra, the Committee determined that it had assimilated all of the information contained in the Report quite accurately. See

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229. The Committee also received and reviewed a great deal of documentary material, including ALAB-772, relating to the various aspects of the training program and the remanded training issues. See Committee, ff. Tr. 31,749, Special Report, Table A-2. These documents provided the Committee with detailed descriptions of the various aspects of the training program, including procedures for exam construction and administration, instructor development, exam security, and operator training. Among these materials were various assessments of the training program by the NRC and independent consultants.

230. The Committee further testified that their initial session included both guided and unescorted tours of the TMI training facility, a tour of the TMI-1 plant, including the

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Tr. 32,024 (Christensen); see also Tr. 33,185 (Persensky). The Committee did discover, however, that the Report failed to state that Mr. Frederick, former Supervisor of Licensed Operator Training, failed his SRO instructor certification for TMI-1 when he took the exam in March, 1984. Tr. 31,750-51 (Uhrig). None of the Committee members could recall learning of this fact during their May-June briefings; however, both Mr. Leonard and Dr. Coe recalled relating this fact to Committee members. See Tr. 31,958-60 (Uhrig, Gardner, Kelly, Kimel, Christensen); compare Tr. 32,354 (Coe); Tr. 32,465-68 (Leonard). Apparently, this was the one fact that was not assimilated during the Committee's intensive work sessions at TMI and Parsippany in May-June, 1984.

control room, and independent discussions81/ with a number of individuals associated with the training program. Committee, ff. Tr. 31,749, at 4, and Special Report, Table A-1; Tr. 31,793 (Uhrig). The Committee testified that GPU Nuclear did not impose any limitations on its contacts with individuals or its pursuit of information. Committee, ff. Tr. 31,749, at 4-5.

231. During the first three days of review at TMI, the Committee was essentially involved in data-gathering, topical discussions and the development of an approach to addressing the remanded training issues. See Tr. 31,797 (Christensen, Gardner). The Committee members then disbanded, taking with them much of the voluminous material which they had received to continue their review of the training program independently. Tr. 31,796 (Uhrig); Tr. 31,798-801 (Uhrig, Kelly, Gardner).

232. The members of the Committee tended to focus on those topic areas most closely associated with their respective areas of expertise and experience when they conducted their assessment of the training program. Thus, Dr. Christensen focused on the adequacy of the simulator programs, Dr. Gardner focused on the educational quality of the operator training

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81/ For example during one such discussion, Mr. Kelly probed Mr. Boltz, an SRO and (then) Supervisor of Simulator Instruction, about operator attitudes with respect to the training program. Tr. 31,837-38, 32,027 (Kelly).

programs, Mr. Kelly and Dr. Kimel concentrated on the substance of the program, and Dr. Kimel and Dr. Uhrig paid particular attention to the management issues of interest. The Committee members testified that they did not restrict their review to topics that were within their areas of expertise, but instead reviewed as much information as personally feasible, particularly since the topics were not mutually exclusive. See Committee, ff. Tr. 31,749, at 25.

233. The Committee reconvened from June 6 through June 8 in Parsippany, New Jersey, site of GPU Nuclear headquarters.82/ The Committee members worked long hours during this session which was devoted to the drafting of the Special Report. The Committee members drafted sections of the report independently and met as a group several times each day to discuss those sections of the report that needed improvement. Tr. 31,804-05 (Uhrig). The Committee left Parsippany on Friday, June 8, leaving Dr. Uhrig to complete the organization of the

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82/ Dr. Kimel spent part of the second day, June 7, at TMI where he talked extensively with Mr. Newton, Manager-Plant Training, Mr. Irizarry, (then) Simulator Development Manager, Mr. Boltz, (then) Supervisor-Simulator Instruction and Mr. Gifford, Vice President Communications. Tr. 31,803-04 (Kimel). The BPTS was demonstrated for Dr. Kimel at that time. Id. Dr. Kimel further testified that he had reviewed the cheating incidents and Mr. Newton's responsibilities as Supervisor Licensed Operator Training during that visit. Tr. 32,015 (Kimel). Dr. Kimel also spent part of his time at TMI reviewing the Operations Plant Manual. Tr. 31,825 (Kimel).

first draft of the Special Report on June 9. Tr. 31,805-06 (Uhrig). From that date until June 27, the Committee members continued their review of the training program and called in their corrections to Dr. Uhrig, who had assumed primary responsibility for the final organization and editing of the Special Report. See Tr. 31,808-14 (Uhrig, Kimel, Christensen, Kelly, Gardner). Dr. Uhrig estimated that he devoted 3 days to this process; Dr. Kimel, 3 days; Dr. Christensen, 15 days; Mr. Kelly, 2 days; and Dr. Gardner, 10-15 days. Tr. 31,811-14 (Uhrig, Kimel, Christensen, Kelly, Gardner). The various revisions of the report that resulted from this process were forwarded to Dr. Coe, who assigned other GPU Nuclear personnel to correct factual errors. Tr. 31,829 (Uhrig). Dr. Uhrig testified that the culmination of this overall process came on June 28, 1984, when the official copy of the Special Report was transmitted to Mr. Clark, President, GPU Nuclear. Tr. 31,811 (Uhrig).

234. The Committee's May-June review of the TMI-1 licensed operator training program to address the remanded training issues entailed a sweeping review of the licensed operator training program. Through extensive document review, intensive briefings by Training and Education management personnel and a limited degree of first-hand review, the Committee investigated the remanded issues. During that time, the

following subject areas of the TMI-1 licensed operator training program were investigated by the Committee.

235. Cheating. The remand essentially was based on the Appeal Board's concern about the OARP Review Committee's opinion of the TMI-1 licensed operator training program "in light of the cheating incidents" which occurred after the issuance of the 1980 OARP Report. ALAB-772, 19 N.R.C. at 1234-35; ¶ 4, supra. The Committee reviewed the training program with that in mind; however, as the Committee's testimony reflects, cheating is a very difficult issue to address, and the reasons for it are even more enigmatic. See Committee, ff. Tr. 31,749, at 5; Tr. 32,032-34 (Christensen, Gardner). The Committee, therefore, concentrated its efforts on reviewing the responsive steps taken to prevent cheating in the future, rather than engaging in what they considered a valueless and perhaps impossible attempt to determine what each of them would have thought had they known that conditions existed that subsequently permitted cheating to occur on NRC and Licensee exams.83/

83/ The Appeal Board directed the following question to Dr. Gardner specifically: "it is essential to know if Dr. Gardner's favorable opinion of the Operator Accelerated Retraining Program...would be altered by the subsequent knowledge of cheating on licensee and NRC examinations." 19 N.R.C. at 1234. In the Special Report, Dr. Gardner, stated that his opinion would not have been altered. Committee, ff. Tr. 31,749, Special Report at 68-71. Dr. Gardner also addressed the Appeal Board's con-

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Committee, ff. Tr. 31,749, at 6; Tr. 31,916 (Uhrig). Consequently, through discussions with training management personnel and documentary review, the Committee focused on GPU Nuclear's precautionary efforts to prevent cheating in the future. In particular, during the May-June review, the Committee evaluated exam security procedures and management communications with Operations and Training personnel. See Committee, ff. Tr. 31,749, at 6, 22-24; id., Special Report at 26-27, 75-78; see also Long & Coe, ff. Tr. 32,202, at 5-12.

236. Training Resources. The Committee received and reviewed information regarding: the GPU Nuclear Training and Education ("T&E") Department budget and staff; the qualifications and performance of the management responsible for the T&E Department; the TMI training facilities; the BPTS; and the number and qualifications of the licensed operator instructors during their May-June review. Committee, ff. Tr. 31,749, at 7-10.

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cern regarding the Committee's opinion of the involvement in cheating of one or more of the instructors evaluated by the original OARP Committee and found it of no present concern to him. See ALAB-772, 19 N.R.C. at 1235; and see Committee, ff. Tr. 31,749, Special Report at 71-72.

237. Program and Procedures. The Committee received and reviewed a wealth of information pertaining to the various TMI-1 licensed operator training programs and procedures during their May-June evaluation of the training program. The Committee reviewed the instructor development program, including instructor job descriptions and specifications, the procedures for instructor evaluation, curriculum development, development of behavioral learning objectives, preparation of lesson outlines and lesson plan formats, utilization of audio-visual aids, instruction techniques, examination preparation, evaluation techniques, and counseling techniques. See Committee, ff. Tr. 31,749, at 10-14; id., Special Report at 20-22.

238. The Committee also reviewed information pertaining to the integration of simulator training into the licensed operator training program, particularly information pertaining to the utilization of the PSI (B&W) simulator programs (including ATOG training), the BPTS, the control room mockup board and the future implementation of the replica simulator for TMI-1. See Committee, ff. Tr. 31,749, at 13, 15-18; id., Special Report at 60-63.

239. Examination construction procedures, including those procedures requiring instructors to code their exam questions with respect to its content and the ment l process

required to respond thereto, were also evaluated by the Committee. See Committee, ff. Tr. 31,749, at 14, 19-21; id., Special Report at 23-24. Mr. Kelly also testified that he had evaluated a sample of the 1982 (Cycle 9) and 1983 (Cycle 10) written RO and SRO requalification examinations, answer keys, and individual results on these written examinations. Committee, ff. Tr. 31,749, at 21; id., Special Report at 48. Mr. Kelly reviewed these examinations to determine whether the scope and technical content of the questions were appropriate. Tr. 33,283-84 (Kelly). In connection with his review of these examinations, Mr. Kelly also reviewed licensed operator training program descriptions to ascertain the scope and content of the requalification program. Tr. 33,283 (Kelly).

240. Communications. The Committee's May-June review of the licensed operator training program and the remanded training issues included an evaluation of the lines of communication between Management, Training, and Operations personnel. The Committee's evaluation of this issue consisted of discussions with Dr. Long, Vice President, Nuclear Assurance, Dr. Coe, Director, Training and Education, Mr. Hukill, Vice President and Director, TMI-1, Mr. Newton, Manager, Plant Training, and Mr. Gifford, Vice President, Communications. Tr. 31,957 (Kimel). Dr. Christensen testified that during these meetings the Committee was briefed on the procedures for receiving and

utilizing feedback from GPU Nuclear personnel relating to examination and training procedures, among other things. Tr. 33,344-45 (Christensen). The Committee also conducted a corroborative documentary review through which they were apprised of a number of communications channels (e.g., formal interviews with operators by the Vice President/Director of TMI-1; operator certification procedures; employee meetings on site held by the Vice President of Nuclear Assurance; and management off-shift tours). Committee, ff. Tr. 31,749 at 22-24; id., Special Report at 75-81.

241. The Committee's initial review of the TMI-1 licensed operator training program was an extremely demanding and painstaking process. The Committee devoted approximately 30-40 man-days to its initial review. Tr. 32,102 (Uhrig).

242. After issuance of the Special Report, the Committee dedicated approximately 160 to 200 additional man-days to a more exhaustive review of the training program. Tr. 32,102 (Uhrig); 32,109 (Kimel). This review involved extensive first-hand analysis of the relevant documentation and additional first-hand observations of the training program and personnel. See Committee, ff. Tr. 31,749, at 24-25. The Committee members undertook this subsequent review to assure themselves that they retained confidence in and soundly endorsed the

conclusions reached in their Special Report. Committee, ff. Tr. 31,749, at 25; Tr. 32,103-04 (Uhrig). In light of the significance of the Committee's current opinion of the training program to the remanded proceeding, the fact that the Committee's opinion is based upon its overall assessment of the training program, and the concerns raised by the NRC Staff and UCS regarding the Committee's review, it is important to address the Committee's subsequent assessment of the TMI-1 licensed operator training program.

b. Committee's Subsequent Assessment

243. The Committee reassembled at TMI on August 13-15, 1984. Tr. 31,972 (Uhrig). Licensee invited the Committee members to spend as much time as they had available to observe and review the licensed operator training program firsthand. Tr. 31,972 (Uhrig). The Committee testified that they accepted Licensee's invitation to undertake a more extensive investigation in order to confirm or refute the Committee's conclusions based upon its initial assessment, and to better prepare the Committee members to apprise us of the foundation for their conclusions during the course of the remanded hearings. Tr. 32,103-04 (Uhrig).

244. We received detailed testimony from the Committee members regarding their evaluation of training procedures

and materials. Mr. Kelly reviewed emergency procedures, including the ATOG training summary and the walk-through program and procedures. Dr. Kimel also reviewed the ATOG training summary and walk-through program. Dr. Kimel, Dr. Gardner and Mr. Kelly reviewed the RO and SRO initial and requalification training program descriptions. Dr. Gardner and Mr. Kelly reviewed the GPU Nuclear Instructor Development Program, the Instructor Indoctrination/Qualification Training Program, the Instructor Evaluation Procedure, the so-called Leonard Memo (Jan. 1984) on Exam Construction, the procedures on exam control and recent RO and SRO examinations. Dr. Uhrig was briefed on the procedures to ensure that the training program reflects the current design of the plant when he was briefed on the procedures for keeping the Operations Plant Manual up-to-date with plant modifications. The Committee familiarized itself with the work of the T&E Advisory Council. The Committee also read the testimony of Licensee's witnesses, which describes the licensed operator training program and related issues, as well as the depositions of Licensee's witnesses and Licensee's interrogatory responses on this issue. Committee Rebuttal, ff. Tr. 33,320, at 3; Tr. 31,948 (Kelly); Tr. 33,276 (Uhrig).

245. The Committee conducted a number of interviews of GPU Nuclear management, and Training and Operations personnel for the purpose of gaining first-hand impressions of the

quality of the personnel involved in the licensed operator training program and to get their views about and attitude towards the training. See, e.g., Tr. 32,062-63 (Uhrig); Tr. 32,063 (Kimel); Tr. 32,067 (Christensen). Dr. Gardner, Mr. Kelly and Dr. Christensen interviewed 5 licensed operator or simulator instructors,84/ 4 replacement operators, and approximately 27 licensed RO's and SRO's including all six shift supervisors who are the on-the-job supervisors. Committee Rebuttal, ff. Tr. 33,320, at 4. Dr. Uhrig testified that he asked operators about such things as their responsibilities, their present attitudes about the cheating and Licensee's response thereto, and their attitudes toward training. Tr. 32,062-63 (Uhrig). Dr. Kimel added that he asked operators about their feelings regarding the quality of training instructors. Tr. 32,064-65 (Kimel). Dr. Gardner testified that he and Dr. Christensen preferred to interview operators together so that one of them would be free to pick up on weak responses thereby making it difficult for an interviewee to stand on an incomplete or evasive response. Tr. 32,067, 32,155, 33,279 (Gardner). Mr. Kelly testified that his earlier interviews of licensed operators had addressed operator attitudes toward

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84/ Dr. Christensen testified that he also engaged in general discussions about the program with two other licensed operator instructors. Tr. 32,155 (Christensen).

training and areas of improvement, and that his later interviews also included questions related to the RHR Report. Tr. 31,843-44, 31,848, 31,855 (Kelly). Mr. Kelly further testified that he had interviewed operators with respect to their opinions of the quality of the training instructors and their opinions of the instructors' attitude toward them. Tr. 32,068-69 (Kelly). The Committee's testimony indicated that it had conducted its interviews of operator instructors in similar fashion. Tr. 32,070-71 (Kelly, Gardner). Mr. Kelly testified that he had also conducted less formal discussions with several operators and instructors concerning debriefings undertaken to prevent negative transfer from the B&W simulator to the TMI-1 control room. Tr. 32,074 (Kelly). The Committee finally noted that although the operators interviewed were usually designated as available by the shift supervisor on duty, it had no reason to believe that any operators were either preselected or intentionally restrained from interviewing. Tr. 31,859-60 (Gardner, Christensen); Tr. 33,278 (Gardner, Kelly, Christenson, Uhrig, Kimel).

246. All five Committee members have had significant interaction with the Vice President of Nuclear Assurance, Dr. Long, the Director of T&E, Dr. Coe, the Manager of Plant Training, TMI, Mr. Newton and the Operator Training Manager, Mr. Leonard. Mr. Kelly and Dr. Uhrig spent time with the new

Supervisor, Licensed Operator Training, Mr. Maag, discussing training issues with him. Committee Rebuttal, ff. Tr. 33,320, at 4. The Committee met as a group with Mr. Hukill. Id. Moreover, Dr. Uhrig and Dr. Kimel met separately with Mr. Clark and with Mr. Hukill. Id. During his discussions with Dr. Kimel and Dr. Uhrig, Mr. Clark addressed the selection of training managers, the appointment of Dr. Long to Vice President, Nuclear Assurance, GPU Nuclear's disposition of Mr. H, and the priorities assigned to the training program as manifested by the resources devoted thereto. Tr. 31,928, 33,282-83, 31,941, 32,162-63 (Uhrig, Kimel). Mr. Kelly, Dr. Gardner, Dr. Christensen and Dr. Kimel reviewed simulator training with Mr. Irizarry, (then) Simulator Training Manager, and with Mr. Boltz, Supervisor of Simulator Training (who has now replaced Mr. Irizarry) at TMI. Committee Rebuttal, ff. Tr. 33,320, at 4. The Committee further testified that it met with Mr. Ross and Mr. Hukill. At these meetings, Messrs. Hukill and Ross explained the reasons for their satisfaction with the training program and the licensed operators' ability to transfer the knowledge gained therefrom to job performance in the plant. Tr. 32,138-39 (Uhrig). As part of this review, Mr. Ross gave all five Committee members a tour of the plant and explained the impact of various aspects of the licensed operators' training. Tr. 32,138-39 (Uhrig).

247. The Committee's classroom observations involved the visitation of a cross-section of classes given to TMI-1 licensed operators or given by TMI-1 licensed operator instructors. Committee Rebuttal, ff. Tr. 33,320, at 4. Mr. Kelly observed 8 classes. Tr. 31,910 (Kelly). Dr. Gardner observed 7 classes. Tr. 31,894 (Gardner). As part of his review, Dr. Gardner testified that he carefully reviewed the procedures concerning the development of lesson plans; and that he frequently spoke with instructors after observing their classes and reviewed the lesson plan for that particular class. Tr. 31,944 (Gardner). Moreover, Mr. Kelly reviewed the lesson plans' technical content and checked them to assure himself that they reflected the current plant design. Tr. 31,946 (Kelly). Both Mr. Kelly and Dr. Gardner also visited a sample of non-licensed operator classes and two BPTS classes. Committee Rebuttal, ff. Tr. 33,320, at 4-5. Dr. Kimel observed 8 licensed operator training classes. Tr. 31,906-09 (Kimel). And Dr. Christensen observed 4-6 classes. Tr. 31,898 (Christensen). Dr. Gardner, Dr. Kimel and Mr. Kelly observed the TMI-1 control board mockup while it was being used as a training device. Committee Rebuttal, ff. Tr. 33,320, at 5. Dr. Gardner also observed instructors using an overhead projector and various hand-out materials. Tr. 32,158-59 (Gardner).

248. With regard to the Committee's supplemental review of simulator instruction, Dr. Christensen went to the B&W simulator in order to observe implementation of the TMI simulator program and, particularly, the quality of the instruction given in the classroom and at the simulator to TMI-1 operators. Committee Rebuttal, ff. Tr. 33,320, at 5. Mr. Kelly also visited Lynchburg for this purpose. Id. While there on one occasion, Mr. Kelly observed B&W instructors perform casualty drills for Crystal River operators as part of his assessment of their qualifications. Tr. 33,280 (Kelly). This review was considered relevant because TMI operators undergo similar drills with the same instructors. Id. All five Committee members were briefed on and observed the use of the BPTS. Committee Rebuttal, ff. Tr. 33,320, at 5. In addition, Mr. Kelly observed four hours of BPTS training and four hours of demonstration of specific B&W PWR operating characteristics. Id. During this visit, Mr. Kelly was able to review a demonstration of how the BPTS causes an operator to use his problem solving skills. Tr. 32,080 (Kelly). Dr. Christensen was briefed on GPU Nuclear's plans to keep the replica simulator current with plant design modifications and their plans to avoid negative transfer. Committee Rebuttal, ff. Tr. 33,320, at 5; Tr. 32,078-79, 32,124-25 (Christensen). Mr. Kelly also discussed with several operators Licensee's measures to avoid

negative transfer. Tr. 32,074 (Kelly). Through these discussions he learned that: 1) trainees are briefed regarding the differences between the TMI-1 control room and the PSI (B&W) simulator; 2) instructors use TMI procedures; 3) instructors address differences between the TMI control room and the simulator during the training session; 4) trainees are formally debriefed after the simulator session; and 5) trainees informally discuss the differences between the simulator training and the TMI control panel and procedures. Tr. 31,875-76 (Kelly); see also Tr. 32,068 (Kelly).

249. Mr. Kelly, Dr. Christensen, and Dr. Gardner observed the administration of several exams and verified compliance with the control of examination procedures by following a GPU Nuclear check-off list of exam administration procedures. Committee Rebuttal, ff. Tr. 33,320, at 5; Tr. 32,081-82 (Gardner, Kelly, Christensen). Dr. Gardner discussed exam administration with several instructors. Tr. 32,083 (Gardner). In addition, the Committee further assured itself that exam security procedures are effectively implemented through briefings and document review. Tr. 32,081 (Uhrig).

250. Dr. Gardner and Mr. Kelly also conducted a substantive review of Licensee's examination process. Mr. Kelly and Dr. Gardner reviewed all of the RO and SRO 1982 (cycle 9)

and 1983 (cycle 10) written requalification examinations. Tr. 31,882-84 (Kelly). Mr. Kelly reviewed these examinations to assure himself that their scope and content addressed the material taught in the requalification program. Tr. 31,883 (Kelly). He also reviewed the answers to ascertain whether these exams contained a proper balance of theoretical and procedural questions. Id. Dr. Gardner and Mr. Kelly utilized the GPU Nuclear exam construction matrices, which are designed to ensure that all exams cover the proper subject material and test appropriate mental processes, when they reviewed the requalification exams to assess the level of memorization required and the technical content of the exam questions. Tr. 33,280-81, 33,283 (Gardner, Kelly). Mr. Kelly's assessment also included a review of the process employed to update the questions in the exam bank. See Tr. 31,888-90 (Kelly). Mr. Kelly reviewed the failure rate for cycles 9 and 10 in order to assure himself that those individuals who failed were properly requalified and retested.85/ Tr. 32,172 (Kelly). Mr. Kelly also reviewed the results of Licensee's oral and simulator

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85/ Mr. Kelly testified that the failure rate for the 1982 and 1983 requalification exams was considerably lower at TMI than at some other facilities because the TMI training program is very well established, and well implemented by qualified T&E management and staff. Tr. 32,173-74 (Kelly). He also stated that the lower failure rate was attributable to the operators' motivation to do well on exams. Tr. 32,174 (Kelly).

exams. Tr. 31,864 (Kelly). In addition, Mr. Kelly reviewed the licensed operators' NRC exam passage rate; however, the Committee did not rely on this information when it formed its opinion regarding the adequacy of the licensed operator training program. Tr 32,085-87 (Kelly); Tr. 31,967 (Kelly, Kimel, Gardner, Uhrig, Christensen).

251. The Committee's initial assessment of communications mechanisms consisted of discussions with T&E management and the review of documents evidencing communications channels and management's encouragement thereof. The Committee testified that its subsequent assessment also included a review of the numerous corporate memoranda encouraging the development of strong communications channels. More importantly, however, the Committee's subsequent assessment included interviews with licensed operators and instructors during which their attitude regarding the communications mechanisms in place were addressed, in addition to corresponding discussions with Messrs. Clark, Hukill, Long, Coe, Newton, Leonard and Ross. See Committee Rebuttal, ff. Tr. 33,320, at 6.

252. Members of the Committee reviewed documents describing the instructor development program, Licensee training instructor criteria and procedures for instructor evaluation. Instructors were evaluated in particular by Dr.

Gardner (education specialist) and Mr. Kelly (subject-matter expert). Dr. Gardner reviewed the performance evaluations for each of the TMI-1 licensed operator instructors for 1983 and 1984. Dr. Gardner and Mr. Kelly then compared their own assessments of the instructors with GPU Nuclear's to assure themselves of the expected consistency between the two. Dr. Gardner and Mr. Kelly also attended portions of the most recent instructor development program and observed first-hand its structure, content and execution. During this time, Dr. Gardner and Mr. Kelly had the opportunity to obtain several instructors' views of the instructor development program. Dr. Christensen, Dr. Kimel and Mr. Kelly also observed the training of two instructors on the use of the BPTS as an instructional device. Committee Rebuttal, ff. Tr. 33,320 at 6; Tr. 31,907-08 (Kimel).

253. Dr. Gardner and Mr. Kelly reviewed licensed operator instructor resumes, audited classes utilizing Licensee's operator instructor evaluation sheet, reviewed instructor performance evaluations and interviewed them in order to assess their qualifications, professionalism, pride, enthusiasm and the quality of their instruction. Tr. 31,911-14 (Kelly, Gardner); Tr. 32,069 (Kelly); Tr. 32,076-77, 32,084-85 (Gardner); Committee Rebuttal, ff. Tr. 33,320, at 8.

254. The Committee's subsequent assessment also included the review of certain documents that the NRC Staff's witnesses suggested were germane to an evaluation of the TMI-1 licensed operator training program, especially with regard to operator attitude. Specifically, the Committee reviewed the RHR Report86/ and its supporting TMI raw data and NUREG-0680, Supp. 4.87/ However, the Committee testified that it did not rely on these documents in formulating its views because it felt that its first-hand observations were more pertinent. The Committee further testified that Mr. Kelly and Dr. Gardner had reviewed the notes of Ms. Morisseau, which we understand form the basis for the conclusions about operator attitude in NUREG-0680, Supp. 4, and Ms. Morisseau's deposition, in which these notes were discussed. The Committee also reviewed and placed reliance on Licensee's memorandum responding to the RHR Report. Committee Rebuttal, ff. Tr. 33,320 at 7; Tr. 31,851 (Gardner, Kelly): Tr. 31,855 (Kelly); Tr. 33,297-98 (Gardner,; Tr. 33,322-23 (Gardner, Kelly); see Tr. 33,226 (Morisseau).

86/ See ¶¶ 220-221, supra; nn.72-74, supra.

87/ NUREG-0680, Supp. 4, entitled: "TMI-1 Restart, An Evaluation of the RHR, BETA, and Draft INPO Reports as They Affect Restart Issues at Three Mile Island Nuclear Station Unit 1 Docket 50-289" (October, 1983), documents the Staff's review of portions of the organization, management, training programs and operational practices at TMI-1 and the related findings of the RHR and BETA reports.

255. The Committee members reviewed with Licensee its implementation of job/task analyses in the licensed operator training program. See Committee Rebuttal, ff. Tr. 33,320 at 10. Dr. Christensen testified that he was briefed on the job/task analysis process by Licensee who at that time explained that GPU Nuclear was in the process of modifying the INPO generic job/task analysis to make them TMI-specific. Tr. 33,324-25 (Christensen). Dr. Christensen was also briefed on the process of correlating job/task analysis with behavioral learning objectives in terms of the development, implementation and practical applications of behavioral learning objectives. See Tr. 33,330-32 (Christensen). Dr. Gardner evaluated the process of correlating job/task analysis data with behavioral learning objectives by reviewing operator duties, behavioral learning objectives in the Operations Plant Manual and INPO's generic job/task analysis. Tr. 33,330-31 (Gardner). The Committee was apprised of and reviewed the existence and use of performance based behavioral learning objectives, the Operations Plant Manual, the TMI-1 Self-Evaluation Report submitted to INPO, table-top task analysis (general determination of tasks required to perform a job), plant walk-through, on-the-job training and simulator training, all of which are based upon or related to job/task analysis. Committee Rebuttal, ff. Tr. 33,320 at 10-11; Tr. 33,324-30 (Kimel, Christensen).

Moreover, the Committee testified that it received and reviewed information on the correlation between job/task analysis data to behavioral learning objectives and exam questions. Tr. 33,330-33 (Gardner, Christensen). Dr. Kimel reviewed behavioral learning objectives, the Operations Plant Manual, plant specific task lists and the generic INPO job/task analyses to assure himself that the licensed operator training program is performance based Tr. 33,325-27 (Kimel). In addition, Dr. Christensen received a briefing on table-top analysis from Dr. Knief and observed plant walk-throughs for the same purpose. Tr. 33,327-28 (Christensen). The Committee also evaluated the process for translating job/task analysis data into exam questions. Dr. Christensen was briefed on the process whereby tasks identified from the job/task analysis will be evaluated to assess the best method to teach the task (e.g., classroom, simulator, using a teaching-aide, etc.). Tr. 33,332 (Christensen). Moreover, Mr. Kelly and Dr. Gardner reviewed the requalification exams to determine whether they corresponded with the behavioral learning objectives. Tr. 33,333 (Gardner, Kelly).

256. With regard to the Committee's review of on-the-job training, Mr. Kelly testified that he discussed on-the-job training with TMI-1 training management personnel. He also interviewed operators to ascertain how they received their

on-the-job training. Mr. Kelly inquired into licensed operator performance during operations, such as heat-ups and cool-downs. He also reviewed check lists and qualification cards used in conjunction with on-the-job training. Tr. 33,339-40 (Kelly).

257. Finally, the Committee received and familiarized itself with the Data-Design Laboratories (DDL) report,88/ NUREG-0680, Supp. 5, the SALP89/ report and NRC Inspection Report 84-05 (operator readiness evaluation). The Committee testified, however, that it did not rely on these independent assessments, nor did it attempt to emulate them; rather, it relied on the backgrounds and experiences of its members to assess the TMI-1 licensed operator training program. Committee Rebuttal, ff. Tr. 33,320 at 10.

88/ Data-Design Laboratories was commissioned by GPU Nuclear to conduct an independent assessment of selected TMI-1 training programs. Its findings are documented in a multi-volume report entitled: "Assessment of Selected TMI-1 Training Programs" (September 10, 1982). The DDL assessment was conducted by a team of ten individuals over a three month period.

89/ U.S. Nuclear Regulatory Commission, Region I: "Systematic Assessment of Licensee Performance, GPU Nuclear Corporation, Three Mile Island Nuclear Station, Unit 1" (April 2, 1984).

c. NRC Staff Recommended Methodology

258. We received testimony from the NRC Staff which was limited to its assessment of the adequacy of the methodology employed by the Reconstituted OARP Review Committee during its evaluation of the TMI-1 licensed operator training program with respect to the remanded training issues. Staff, ff. Tr. 33,148, at 2.90/ The Staff presented what it considers to be an appropriate methodological approach to assessing the licensed operator training program in light of the remanded training issues. The Staff presented its evaluation of the Committee's methodology by comparing its recommended methodology to that utilized by the Committee. Staff, ff. Tr. 33,148, at 3.91/

90/ The three Staff witnesses were Dr. Julius J. Persensky, Ms. Delores S. Morisseau and Mr. Joseph J. Buzy. Dr. Persensky is Section Leader of The Personnel Qualifications Section, Licensee Qualifications Branch, in the NRC's Division of Human Factors Safety. He holds a B.A. in Psychology, a M.A. in Experimental Psychology, and a Ph.D. in Applied Experimental Psychology. Ms. Morisseau is a Training and Assessment Specialist, Licensee Qualifications Branch, Division of Human Factors Safety. She holds a B.A. in Psychology and a M.A. in Industrial Psychology. Mr. Buzy, the Staff's subject matter expert in this case, is a Systems Engineer (Training & Assessment), Personnel Qualifications Branch, Division of Human Factors Safety. Mr. Buzy holds a B.S. in Marine Engineering in addition to his vast experience in the nuclear power field over the past 20 years. Staff, ff. Tr. 33,148, attached qualification statements.

91/ The Board notes that neither the methodology to be employed by the Committee, nor the requirements for any Committee

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259. The Staff outlined approximately 110 steps that it felt could be taken or items that could be reviewed in an evaluation of the TMI-1 licensed operator training program in accordance with the Appeal Board's remand.92/

260. The Staff recommended that an appropriate review of the training program should include the review of the following documents: the 1980 OARP Committee Review Report, LBP-81-32, LBP-82-34B, LBP-82-56, ALAB-772, the DDL Report (September 10, 1982), NUREG-0680 (June 1980) including Supplements 1 through 5, the RHR Report (March 15, 1983), BETA Report

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report are addressed anywhere within the Appeal Board's remand of the training issues. While we agree that the bases for the Committee's findings are significant and subject to challenge, we are not certain that the method of gaining that information is significant absent any showing that we should doubt the accuracy of the information presented to us by the Committee. Nevertheless, a discussion of the Staff's concerns regarding the methodology employed by the Committee when it evaluated the training program would be of some value.

92/ In its testimony, the Staff acknowledges that it does not conduct its own reviews of licensee programs using the methodology it proposes. The Staff explains this as reasonable because the Staff is constrained by law in what it can review, and its inspection program provides the Staff with regular input on the status of training at licensee facilities. Staff, ff. Tr. 33,148, at 33,175-76 (Persensky). The Board need not address the merits of the Staff rationale. The fact is that the Staff recommended a methodology it felt the Committee could have used, and evaluated the Committee's work against that methodology.

(February 28, 1983)93/ and the INPO Annual Report (1983), in addition to the training procedures and training materials (e.g., lesson plans, learning objectives, examinations) relevant to the remanded issues. Staff, ff. Tr. 33,148, at 8-9. The Staff's methodology would also include interviews with training managers, licensed operator instructors, shift supervisors and operators, and observations of classrooms, instructors, and examination administration (written, oral and simulator). Staff, ff. Tr. 33,148, at 9. The Staff would approach its assessment of the training program in accordance with the three topical categories that it derived from the remanded training issues. These categories are: 1) management/communications/attitudes; 2) training systems/programs; and 3) GPU Nuclear examinations. Id. at 10.

261. In the Staff's opinion, an appropriate assessment of its first category (management/communications/attitudes) would essentially consist of a series of interviews with training management, instructors and operators, as well as an extensive review of relevant documents (e.g., documents

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93/ GPU Nuclear commissioned Basic Energy Technology Associates, Inc. (BETA) to review GPU Nuclear, including the TMI-1 Training Department, from a cost efficiency standpoint in December, 1981. BETA's findings are documented in its report entitled: "A Review of Current and Projected Expenditures and Manpower Utilization for GPU Nuclear Corporation." (February 28, 1983). See ALAB-738, supra, 18 N.R.C. at 198-99.

concerning communications mechanisms, management resumes and job descriptions, instructor resumes and performance evaluations, documents concerning the instructor development program, the RHR Report, NUREG-0680, Supp. 4, the DDL Report, and documents concerning attrition rates and absenteeism). Id. at 11-19. Specifically, an evaluation utilizing the Staff's methodology would include interviews with: training managers regarding communications mechanisms and the effectiveness of the instructor development program; operators with respect to their opinion of the quality of the instructors, their perception of communications, their attitudes toward the training program, and their level of "pride and enthusiasm";94/ and the training staff to ascertain their assessment of operator attitude and communications mechanisms. Staff, ff. Tr. 33,148, at 11-19. The Staff's methodology would also include classroom observations by a subject-matter expert to review the quality of instruction, instructor attitude, operator attitude and course content. Finally, the Staff recommends that an evaluating party review: organizational documents to determine the structure of the training program and its relationship to corporate and plant management structure; documents concerning

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94/ The Staff's methodology suggests that interviews regarding operator pride and enthusiasm should utilize questions that parallel the RHR survey questions. Staff, ff. Tr. 33,148, at 16.

training department staff qualifications and job specifications, especially those of Messrs. Long, Coe, Newton and Frederick, to ensure that they are qualified to serve in their positions; documents related to the cheating incidents to investigate the involvement (if any) of these individuals; and documents describing the instructor development program, including instructor criteria and instructor evaluation procedures and records of instructor attendance in addition to a review of the aforementioned documents. Id.

262. The Staff's recommended approach to the evaluation of its second category (training systems/programs) is dedicated in large part to ensuring that the licensed operator training program is performance-based. The Staff's methodology involves the review of the job/task analysis and the procedures for linking job/task analysis data to learning objectives. The Staff's methodology further recommends the review of learning objectives to ensure that they are clearly stated and that they properly reflect the task analyses for each job. The evaluating party should observe on-the-job training to ensure that it is consistent with job/task analyses and actual plant operations. It should review or observe classes, lesson plans, handout material and simulator training to ensure that these items are consistent with program descriptions. Also, the reviewing group should review simulator training to determine

whether it is centered on problem-solving and symptom-based analyses. The Staff further believes that an appropriate review would include the evaluation of the performance evaluations of the operators who have gone through the training program.95/ Staff, ff. Tr. 33,148, at 19-20.

263. As a part of the inquiry into the program's adequacy, the Staff would consider the Appeal Board's question whether deficiencies in testing were symptomatic of more extensive failures. Here, the Staff would review the cheating decisions to ascertain what deficiencies existed before, and review the relevant areas of the training program, including lesson plans, to determine whether more extensive failures now exist in the training program. Id. at 21. As to whether the training program enhances knowledge rather than encouraging memorization, the Staff recommends first determining the extent of memorization required to perform as an operator. The reviewing group should then inspect lesson plans and class instructional plans for inappropriate repetition and to ensure that training concepts are integrated with plant operation

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95/ The Staff acknowledged that GPU Nuclear does not maintain specific control room operator performance evaluations; however, Mr. Persensky still believes that some effort should be made to evaluate the performance of graduates of the training program. Tr. 33,143 (Persensky). Dr. Regan also supports the review of job performance evaluations as a measure of the adequacy of the training. Tr. 32,784-86 (Regan).

requirements. Classes should be observed to determine if instructors encourage memorization through repetition and to determine if there are opportunities for discussion and team work. If memorization is required the reasons for it should be explained to the reviewing group. Quizzes and examinations should be inspected to determine the types of questions asked, and the balance between the mental processes required to respond to these questions. They also should be reviewed to ensure that the questions encourage discussion of the relationship between concepts and operational requirements. At the simulator, lesson plans should be reviewed and exercises observed to ascertain whether a variety of situations are presented. Id. at 22-23.

264. The Staff's recommended evaluation also would require the examining party to: visit the TMI training center to assess its adequacy and to observe the instructors' use of training aids; evaluate training expenditures to determine the adequacy and appropriateness of the training programs; observe and evaluate the training instructors qualifications against the documented instructor criteria, in addition to reviewing the new instructor evaluation forms; review the simulator training lesson plans and learning objections for consistency with task analyses; have a subject-matter expert observe simulator training at PSI (B&W) and on the BPTS; and review the

GPU Nuclear performance evaluations of simulator instructors. Staff, ff. Tr. 33,148, at 23-26.

265. Finally, with respect to the Staff's recommended methodology for assessing its third category (GPU Nuclear examinations), the Staff witnesses testified that exam development procedures, security procedures, content, format and administration should be reviewed by direct inspection of the exams and by observation of the administration of exams. To this end, the Staff testified that a party conducting an evaluation of this issue should review: documentation describing exam security, construction and administration procedures for written, oral and simulator exams; exam content to ensure that it is consistent with job/task analyses, behavioral learning objectives and current plant design; exam questions to determine balance between responses testing recall skills and those testing an operator's ability to solve problems and address plant systems. The evaluating group should also observe and review the content of simulator and oral exams in addition to reviewing them to ensure that Licensee's written exams offer an effective means of measuring an operator's ability to run the plant. The reviewing party should, finally, observe the administration of examinations, review exam answer keys for technical accuracy, and interview trainees to ascertain their opinion of the importance of exam integrity. Staff, ff. Tr. 33,148, at 27-31.

266. We have carefully examined the testimony of both the NRC Staff and the Reconstituted OARP Review Committee concerning the Staff's view of an appropriate methodological approach to addressing the remanded issues and the Committee's actual methodological approach to those issues. We are struck by the similarity between the Staff's approach and that taken by the Committee when it conducted its assessment of the TMI-1 licensed operator training program. In our estimation, the Committee reviewed or observed at least 85% of the items recommended by the Staff. The magnitude of the remaining differences between these two methodologies is not of such a nature that we feel that our confidence in the substantive findings of the Committee has or should be in any way diminished. To the contrary, given the extraordinary expectations of the Staff, the methodology utilized by the Committee is impressive.

267. An initial comparison of the Staff's methodology against the Committee's methodology shows that both methodologies are designed to gather information regarding those areas of the licensed operator training program which are germane to the remanded training issues. Hence, both methodologies focus on examination construction, content, administration and security; instructor development and instructor qualifications; simulator training (PSI/B&W and BPTS); the implementation of job/task analyses; procedures to ensure that

the training program reflects current plant design; communications mechanisms; operator attitudes; training staff and facilities; and T&E management qualifications. Both methodologies called for the reviewing body to evaluate these topics through documentary review, interviews and discussions with knowledgeable management, training staff, and operations personnel, and first-hand observation of the relevant aspects of the training program. The documents, personnel, procedures and programs reviewed, interviewed or observed or recommended to be evaluated are almost identical, which is not surprising when one considers that both methodologies were designed to review the same training program in order to address the same remanded issues. Upon closer inspection of the evidence presented by the Staff and the Committee, we found that our initial impression was not unfounded. Although we discovered certain differences in the reliance placed on certain information sources,96/ and in the method of reviewing certain aspects of the training program, we found that both methodological approaches are very similar indeed.

268. The Committee reviewed all of the documents recommended by the Staff, with the exception of the first three revisions of NUREG-0680.97/ See ¶ __, supra; Staff, ff. Tr.

96/ See ¶¶ 275, 288 and n.112, infra.

97/ NUREG-0680 and its first three revisions are dated June, 1980, November, 1980, March, 1981, and April, 1981 respectively. Staff, ff. Tr. 33,148, at 8.

33,148, at 8-9. The Committee addressed all of the remanded issues identified by the Staff, and several that the Staff did not address. See generally Committee, ff. Tr. 31,749, Special Report; Staff, ff. Tr. 33,148, at 3-6. The Staff recommended a review of the training procedures and materials that were relevant to the remanded issues, although it did not specify which of those documents were worthy of review. Id. at 9. The Committee, similarly, reviewed all of the training documents and materials concerning training programs and procedures that it determined to be relevant to the remanded issues, including some of those recommended by the Staff which the Committee found to be of limited value. See Committee, ff. Tr. 31,749, Attachment 1, Table A-2, and Attachment 7; ¶¶ 229, 254, 257, supra; n.112 infra. The Staff recommended classroom visitation to evaluate instructor quality, exam administration, instructor attitude, operator attitude, excessive use of repetition, and instructor use of training aids. See ¶¶ 261, 263, supra. The Committee visited approximately 25 licensed operator training classes. See ¶ 247, supra. During the course of its visits, the Committee evaluated instructor performance and matched their findings against the instructors' GPU Nuclear performance evaluations; observed the administration of several written exams while following along the GPU Nuclear exam administration check-off list; observed and evaluated the use of lesson plans

and discussed their use with instructors; observed operator and instructor attitudes; observed the use of various training aids; and assured themselves that the classes did not inappropriately rely on repetition. See ¶¶ 247, 249, 252-53, supra.

269. With regard to interviews and discussions with knowledgeable personnel, the Staff recommended interviews of operators, instructors, and T&E management to address: operator and instructor attitudes; communications mechanisms; training staff and operator morale; operators' perception of instructors, the training program, the integrity of the exam process, the cheating incidents, and the Company response thereto. See ¶¶ 260, 261, 265, supra. The Committee interviewed 27 RO's and SRO's including 6 shift supervisors, 4 replacement operator candidates, 5 licensed operator or simulator instructors and, as well, met with a number of corporate, T&E and operations managers. See ¶¶ 245, 251, supra. During these interviews, the Committee addressed all of the aforementioned issues. Id.

270. The Staff recommended that the qualifications of T&E management, especially those of Dr. Long, Dr. Coe and Mr. Newton, should be reviewed in addition to those of the operator training instructors. See ¶ 261, supra. The Committee testified that it did review the qualifications of the T&E management and of the instructors. See ¶¶ 236, 246, 252-53,

supra. Their evaluation included the review of resumes and performance evaluations, discussions with management, including private discussions with the President of GPU Nuclear, Mr. Clark, classroom observation, and extensive interactions with all three of the individuals highlighted by the Staff. Id.

271. The Committee's assessment included the review of job/task analyses and the procedures for translating them to learning objectives and exam questions, as did the Staff's methodology. See ¶ 255, supra. The Committee's assessment of the integration of job/task analyses into the licensed operator training program involved briefings on and the review of the INPO generic job/task analysis, the TMI-1 Self Evaluation Report which was submitted to INPO, plant specific task lists, the table-top analysis, the use of behavioral learning objectives and the Operations Plant Manual, plant walk-through training, on-the-job training, and written requalification exams and exam development matrices. All of these mechanisms are either related to, reflect or are based upon job/task analyses. Id.

272. Although an evaluation could not include the examination of CRO performance evaluations as none exist,98/ the

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98/ The union contract does not provide for GPU Nuclear to maintain control room operator performance evaluations. Tr.

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Staff believes that an appropriate evaluation would include the review of some indicia of the training graduates' performance. Tr. 33,143 (Persensky). The Committee's testimony, however, indicates that it held extensive discussions with Mr. Hukill and Mr. Ross to ascertain Operations' satisfaction with the training program as manifested by the performance of the operators who have been through the program. See ¶ 246, supra.

273. The Staff recommended that an appropriate review of the training program should include an assessment of the procedures in place to ensure that the lessons and exams are kept up to date with plant modifications. The Committee's assessment addressed this issue through briefings on the procedures in place to keep training in line with plant modifications, a review of the OPM, evaluation of examination questions and examination construction procedures to assure itself that they reflect and will continue to reflect current plant design, and actual first-hand observations of updating of simulator training. See ¶¶ 228, 239, 244, 250, 255, supra; n.119, infra.

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33,143 (Persensky); Tr. 33,419-22 (Ross). Evaluations therefore could not be used to affect individuals' job status. Tr. 33,420 (Ross).

274. The Staff testified during the hearing that the Committee had indeed performed a number of the tasks that the Staff had recommended. The Staff, therefore, testified that it was satisfied that the Committee's assessment properly included: 1) a quality assurance check on the T&E management presentation regarding communications mechanisms, including corroborative interviews with training and operations personnel and a documentary review of the communications mechanisms in place, Tr. 33,141 (Persensky); See Tr. 33,530-31 (Wagner); ¶¶ 240, 251, supra; 2) observation of PSI (B&W) simulator and BPTS training to determine whether problem-solving skills are integrated into those programs, Tr. 33,142 (Persensky); 3) a review of the budget allocated to training and a corroborative tour of the training center to observe its utilization (e.g., proper use of training aids) to assure itself of the adequacy of the training facilities, Tr. 33,144-45 (Persensky); ¶¶ 230, 236, 246-247, supra; and 4) the review of documents describing the procedures for examination security and control and observation of the administration of exams in conformance with these procedures, Tr. 33,146 (Persensky); ¶¶ 229, 235, 244, 249, supra.

275. We also are cognizant of several areas where differences exist between the Staff's methodology and that of the Committee. The emphasis on the significance of the RHR Report and NUREG-0680, Supp. 4 is a prime example. The Staff

argues that these documents are essential to reviewing the issue of operator attitude. Hence, the Staff's methodology would include operator interviews involving questions that were structured parallel to those found in the RHR survey so that a comparison could be drawn between the present attitudes elicited during the operator interviews, the findings in Supp. 4 and those in the RHR Report. See Staff, ff. Tr. 33,148, at 15-16. The Committee reviewed the RHR Report, the raw data related thereto, NUREG-0680, Supp. 4, and Ms. Morisseau's notes; however, the Committee did not rely on this information as a basis for its findings regarding the adequacy of the training program because it believes that the first-hand observations of its members are more pertinent.99/ See ¶ 254, supra. The Committee, therefore, did not structure its interviews such that they would correspond directly with these two documents.100/ The Staff accordingly faulted the Committee because it did not

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99/ On cross-examination, Ms. Morisseau testified that the RHR survey of TMI-1 was conducted in mid-late 1982 during the months immediately following the Special Master's Report and our decision on the cheating incidents. Tr. 33,205 (Morisseau). She also testified that the Staff conducted interviews in preparation of NUREG-0680, Supp. 4 in June, 1983. Tr. 33,206-07 (Morisseau). The Committee's operator interviews were conducted during its subsequent assessment, which began on August 13, 1984. Tr. 31,972 (Uhrig).

100/ Mr. Kelly testified that he did ask some operators about the RHR findings during the course of his operator interviews. See ¶ 245, supra.

compare its findings regarding operator attitude with the findings reported in the RHR Report and NUREG-0680, Supp. 4; and because it did not structure its interviews in parallel with the RHR and NUREG-0680, Supp. 4 assessments. Staff, ff. Tr. 33,148, at 32-33; Tr. 33,140 (Persensky).

276. The Staff also faulted the Committee's methodology because it did not review documents evidencing the instructors' class attendance or performances in the instructor development program. Staff, ff. Tr. 33,148, at 33. In addition, the Staff felt that the Committee's method of evaluating instructors did not fully utilize GPU Nuclear's criteria for assessing the instructors' qualifications.101/ See Tr. 33,140-41 (Persensky).

277. The Staff's testimony also noted the following areas where the Committee's methodology did not compare with its recommended methodology. The Staff felt that the Committee did not review the job/task analyses for TMI-1 licensed operators.102/ Staff, ff. Tr. 33,148 at 34. The Staff also stated

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101/ The Committee did familiarize itself with Licensee's instructor evaluation criteria and utilized these criteria in evaluating instructors, although the instructor form was not filled out. Tr. 31,913 (Kelly). Thus, while the GPU Nuclear criteria were not formally used or formally compared to the Committee members' own critera, they nevertheless were used and evaluated for adequacy by the Committee. See Tr. 31,913-14 (Gardner).

102/ But see ¶¶ 228, 255, supra and ¶¶ 301, 308, 311, infra. In particular, Dr. Kimel testified that he had reviewed the

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that the Committee did not observe on-the-job training.103/ The Committee did not review all training materials to determine the degree of memorization required (with the exception of requalification exam questions), nor did it review or observe simulator or oral examinations regarding this issue. Id. In addition, the Committee did not use job/task analysis data to evaluate oral and simulator examinations. Id.

d. UCS (Dr. Regan) Recommended Methodology

278. Dr. James Regan, an industrial psychologist with approximately 31 years of experience as a researcher in Navy training and other elements of a personnel system,104/

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OPM, behavioral learning objectives, plant-specific task lists and generic INPO task lists. Tr. 31,825, 33,325-27 (Kimel).

103/ Dr. Gardner and Mr. Kelly testified that the Committee did review on-the-job training, however. Tr. 33,138-40 (Gardner and Kelly).

104/ Dr. James J. Regan is currently a self-employed consultant, lecturer at the University of San Diego and visiting scientist with the Battelle Human Affairs Research Center. He holds a Ph.B., M.A. and Ph.D. in Psychology. Dr. Regan also has extensive research experience with the Navy Research and Development Center in San Diego, California. See Regan, ff. Tr. 33,532, Resume. He does not, however, have much personal experience with the conduct of training. Tr. 32,703 (Regan). Dr. Regan describes himself as having no training in technical engineering, no teaching experience (aside from a course and lectures on personnel management), and no significant personal experience with training program curricula development. Tr. 32,774-75 (Regan).

testified on behalf of UCS. Dr. Regan provided us with his model for evaluating the TMI-1 licensed operator training program. Dr. Regan's approach is unique to the extent that it is the only methodology presented that would employ the development of an assessment model that is tailored to the program to be evaluated. See Regan Surrebuttal, ff. Tr. 32,693, at 7.105/ Dr. Regan explained that the development of a model for review should precede the commencement of that review in order to prevent the program from directing the review.106/ Regan Surrebuttal, ff. Tr. 32,693, at 7. For purposes of comparison and completeness, we have included a summary of Dr. Regan's recommended methodology to which we now turn.107/

279. Dr. Regan testified that in order to undertake an evaluation of the TMI-1 training program that would allow

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105/ In evaluating Dr. Regan's model, we are mindful of Dr. Regan's admitted complete lack of familiarity with TMI and training of licensed operators, generally. See Tr. 32,733, 32,735-38 (Regan); see n.28, supra.

106/ Both the Staff and Committee methodologies advocate the review of ALAB-772 and the preceding cheating decisions, as well as the review of several independent assessments and program descriptions as the initial step in reviewing the training program and the remanded issues. Dr. Regan had proposed a similar approach in his initial testimony. See Regan, ff. Tr. 33,532, at 18.

107/ We note that we hold the same reservations concerning the probative value of this discussion absent any evidence of any substantive errors in the findings of the Committee that would indicate that our reliance thereupon would be misplaced.

him to answer the questions raised by the Appeal Board, he would perform a detailed three month study utilizing a team of personnel with both training and nuclear expertise. Regan, ff. Tr. 33,532, at 18, 22. The first aspect of any such effort would be to gather basic information and develop a plan of action.108/ The initial information would come from the company's managerial personnel through briefings and documents.109/ Beyond that initial information, he would review primary materials such as examinations and program documents, and conduct interviews with appropriate personnel. Id. He also would review a sample of task analyses and learning objectives to determine whether they are technically accurate. He would also endeavor to determine whether the job descriptions and other information on which the task analyses were based were, in fact, consistent with the current plant design. Id. at 18-19. Dr. Regan's testimony further indicated that he would review the training materials and instruction to determine whether they were technically correct and whether they

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108/ But see n.106, supra.

109/ Dr. Regan participated in several Battelle-affiliated committees that gave advice to the NRC on licensed operator qualifications and on simulators. Tr. 32,725-32 (Regan). In both cases, the group was made up of a number of experts who pooled their talent and, based on briefings, gave their opinions on the question at issue. Tr. 32,727-28, 32,731-32 (Regan). This process was strikingly similar to the approach initially used by the OARP Review Committee here.

were correctly administered. This would include a detailed review of instructors' training and education, as well as a review of the evaluations of instructors and "the evaluations of simulator performance done by instructors." Id. at 19.110/

280. Dr. Regan would review simulator instruction through observation of the instruction itself. He would also analyze the degree to which any simulators replicate the plant. To the extent that there are any differences, and particularly to the extent that the differences are minor or subtle, he would undertake two separate efforts. First, he would review what the Licensee had done to assure that the differences would not interfere with the operator's ability to operate TMI-1. Second, he would conduct tests appropriate to reveal whether the operators' use of the simulators had created any such interference. Id. at 19.

281. Dr. Regan went on to state that he would be concerned about learning interference problems where, as at TMI, job incumbents and trainees are subject to frequent changes in procedures and requirements 111/ A review of this

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110/ It is unclear whether Dr. Regan is referring here to simulator instructor evaluations, or to evaluations of instructors while they are in training at the simulator.

111/ We did not receive any evidence of the existence of any "learning interference problems," nor do we perceive that to be

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issue would be essentially the same as the review of the problem of a simulator that does not replicate the actual reactor. Id. at 20.

282. Dr. Regan would review examinations and other assessment devices for several purposes: (1) to assess whether exams rely upon objective and standardized measures of performance; (2) to determine whether exam questions are properly constructed, particularly with respect to the behavior that they test and the mental processes that are required to answer them; and (3) to the extent that oral assessments are used, Dr. Regan would inquire whether they are controlled by the use of standardized procedures and whether complete notes of the answers are kept to ensure that they can be reviewed impartially. Id.

283. Dr. Regan's review would focus particularly on the issue of the correlation between exam performance and job

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among the issues remanded to us by the Appeal Board. Nevertheless, Dr. Regan suggested that this problem arises when an individual originally trained on one procedure operates under that procedure for a period of time and is then faced with the implementation of a new procedure. Depending upon the type and extent of the change, the prior learning and experience can significantly inhibit both initial learning and retention of the new material. The problem can become particularly acute in emergency situations, when an operator may tend to revert to previous procedures. Regan, ff. Tr. 33,532, at 20.

performance. In order to address this issue, Dr. Regan would review the types of job performance evaluations that are done by Licensee, the extent to which the evaluations use objective measures, and the extent to which the objective measures are consistent with exam performance. Id at 21.

284. The Regan methodology would include an assessment of how Licensee feeds the results of its training (presumably exam scores) and the results of job performance evaluations back into the training program. Id.

285. Finally, Dr. Regan would systematically examine the attitudes of the trainees toward the training and toward the jobs themselves. This would be done through an anonymous random sampling technique, with a standardized set of questions carefully developed by survey research experts to reveal actual attitudes. Dr. Regan testified that this survey would be useful in conjunction with the other assessments (presumably the RHR Report and NUREG-0680, Supp. 4). Id.

e. Comparison of Methodologies

286. We have carefully reviewed the testimony and documents presented concerning the methodology used by the Committee and the recommended methodologies presented by the Staff and UCS. We find, upon comparing the three methodologies, that

each of them follow a virtually identical progression toward the evaluation of the training program. Although the UCS methodology incorporates the development of a review model as its initial step, the first step incorporated by the other methodologies is the review of the remanded issues. Given our understanding that the primary reason that the Committee recently reviewed the training program was to address the Appeal Board's remanded issues, we firmly believe that any review designed to address those issues should certainly begin with a review of ALAB-772. All three methodologies provide for the review of relevant documents (e.g., program descriptions, cheating decisions, training procedures and independent assessments of the training programs) in the preliminary stages of review. See ¶¶ 229, 260, 279, supra. Management briefings are considered valuable initial sources of information for all three methodologies. See ¶¶ 228, 260, 279, supra. Moreover, all three methodologies employ a series of interviews of GPU Nuclear personnel and first-hand observations of various aspects of the training program to corroborate the information reviewed during their respective initial stages of review. See ¶¶ 230, 245-248, 260-61, 279-80, supra. If anything, the Committee's interview process (number and depth) was more thorough, if less formal, than the processes recommended by the Staff and Dr. Regan.

287. We further discovered that all three methodologies focus on the following aspects of the training program: 1) examination construction, content, administration and security; 2) instructor development and instructor qualifications; 3) simulator training; 4) the implementation of job/task analyses; 5) procedures to ensure that the training program stays up-to-date; and 6) operator attitudes. In contrast to Dr. Regan's approach, the Committee and Staff methodologies also focus on communications mechanisms, T&E management qualifications, and the adequacy of the training facilities. See ¶¶ 228, 236-240, 244-246, 248-253, 255, 260-262, 264-265, 273, 279-280, 282, 285, supra.

288. Recognizing the many similarities which exist among these three methodologies, it is clear that the Committee's approach did not fully conform to either the Staff or UCS methodologies. Each methodology employs different methods for ascertaining the same information. The appropriate method of evaluating operator attitudes elicited the greatest disparity among the three models. The Staff testified that the issue of operator attitudes should be evaluated with reference to the findings in the RHR Report and NUREG-0680, Supp. 4. See Staff, ff. Tr. 33,148, at 14-15. The Committee, on the other hand, relies upon its independent assessment of operator attitudes which it considers to be more pertinent than the out-of-date

findings of the RHR Report and the similarly dated findings of NUREG-0680, Supp. 4.112/ See ¶ 254, supra. UCS' methodology distinguished itself as the only one of the three that would incorporate the use of an anonymous survey to assess operator attitude. See ¶ 285, supra. The Staff's methodology, however, distinguishes itself as the only one that would utilize absenteeism records to evaluate employee satisfaction, notwithstanding the Committee's comparable evaluation of attrition rates. See ¶ 261, supra; Committee, ff. Tr. 31,749, Special Report at 46. Although we are not certain which method of evaluating current operator attitudes is best, we are confident that the Committee's direct operator interviews and conversations with training and operations management is a reliable method of ascertaining that information.

112/ We agree that the findings of the RHR Report are of little probative value in assessing the current attitude of operators of TMI-1. See ¶ 254, supra. Ms. Morisseau's testimony on cross-examination indicated that the RHR survey data was collected in the wake of the Special Master's report and our 1982 cheating decision. See n.99, supra. Operator morale at that time was understandably low. Moreover, Dr. Gardner and Mr. Kelly testified that the RHR findings were both situationally remote and irrelevant to the current operator attitudes which were the subject of their review. See Tr. 32,039-40 (Gardner, Kelly). Dr. Gardner also testified that attitudes are transient, hence the probative value of the findings of NUREG-0680, Supp. 4 (the data for which was gathered 1 1/2 years ago, see Tr. 33,206-07 (Morisseau)), like those of the RHR Report, is minimal with respect to an assessment of current operator attitudes. See Tr. 33,297-98 (Gardner). The Staff included in NUREG-0680, Supp. 4, that the RHR Report represents nothing more than a behavioral sample of attitudes at that time due to the numerous changes that have occurred since the RHR survey was completed. Tr. 33,205 (Morisseau).

289. The following list is representative of the disparity between the Committee's methodology and those of the Staff and UCS. The Committee did not perform the following tasks recommended by the Staff: 1) review instructor development class attendance figures; 2) review training materials to see how much memorization they require; 3) observe on-the-job training to ensure consistency with job/task analyses; 4) observe simulator exams; and 5) observe oral exams. Nor did the Committee perform the following tasks recommended by UCS: 1) review instructor performance on the simulator;113/ 2) technically verify the accuracy of task analyses, learning objectives and training materials; 3) develop a formal model for review before embarking on the program evaluation;114/ and 4) test operators for signs of negative transfer from the B&W simulator to the TMI-1 control room. We do not believe, nor was it shown, that the absence of those tasks from the Committee's methodology materially affects either the overall adequacy of

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113/ The Committee did review PSI simulator instructor performance. See Tr. 32,078-79 (Christensen); Tr. 33,280 (Kelly). The Committee also reviewed licensed operator training at the PSI simulator and the BPTS, which is the same training that is received by licensed instructors.

114/ The Committee did, however, proceed by dividing up issues into the members' respective areas of expertise. Committee, ff. Tr. 31,749, at 25. Also, Drs. Christensen and Gardner developed a "model" for their joint operator interviews. Tr. 32,067, 32,155, 33,279 (Gardner).

that methodology or the accuracy of the Committee's substantive findings. Moreover, the substantive value that would have been derived from performing most of these tasks was determined by other means as discussed earlier.115/

290. In short, we are confident that the Committee's methodology is adequate to allow it to address knowledgeably the remanded training issues. Notwithstanding UCS' conviction that the OARP Review Committee's approach was materially lacking, we are further assured by the overall similarity which exists among the three methodologies. Although we would anticipate that there would be significant differences in the recommended approaches evaluating the training program, there was no evidence that the Committee failed to review, in the generally approved or a like manner, any aspect of the training program.

115/ Dr. Gardner was confident that the Committee's assessment did not suffer because it did not incorporate every step suggested by the Staff and UCS methodologies. He cautioned against the use of "textbook" models for review over a considered mode of review independently tailored in accordance with the issues concerned and the resources available to the reviewing group. He further expressed his confidence in the methodology used by the Committee which included management briefings, first-hand observations, interviews with relevant GPU Nuclear personnel, and the review of relevant documents, especially the TMI-1 Self Evaluation Report ("SER") which was submitted to INPO. Dr. Gardner expressed particular confidence in the data contained in the SER because it was submitted as part of the TMI-1 INPO accreditation process and was therefore subjected to a very detailed quality assurance or confirmatory assessment by the INPO site-visitation team. Tr. 33,350-53 (Gardner).

3. The Committee's Findings

a. Cheating

291. The Committee reviewed the cheating issues in response to the Appeal Board's remand of that issue. See ¶ 235, supra. During the course of this review, the Committee determined that cheating is an issue of personal morality, and is not an easy issue for educators or professionals to grapple with. It is complex in its derivation, highly situational and individual.116/ Management must take the utmost precautions to prevent it. The Committee recognized that the cheating incidents which occurred in April, 1981, as well as the other incidents of cheating discussed by the Licensing Board in its July, 1982, decision were extremely serious and reflected unfavorably on the organizations as well as the individuals involved. The

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116/ There is no evidence that links cheating with deficiencies in the substantive quality of training. To the contrary, the experience of all of the witnesses who testified on this subject, other than Dr. Regan, was that cheating is so highly situational and individual that it cannot be generalized to one cause, nor can one assume that only poor students cheat. See Tr. 32,029-31, 32,032-34 (Gardner, Uhrig, Christensen); Tr. 31,924-25 (Uhrig); Tr. 32,140-45 (Christensen); Tr. 32,148-49 (Gardner); see also Tr. 33,402-15 (Leonard); compare Tr. 32,771-73 (Regan). Indeed, Dr. Uhrig testified that he does not believe that course content had anything to do with the cheating. Tr. 31,924-25 (Uhrig). On the other hand, one cannot preclude the possibility that one contributing cause of cheating may be weaknesses in a training program. See Tr. 32,145-47 (Gardner).

Committee concluded, however, that such behavior on the part of a very few individuals did not negate the "Herculean" efforts of so many -- trainers and trainees -- during the past five years. Committee, ff. Tr. 31,749, at 5.

292. The Committee testified that after the discovery of cheating, GPU Nuclear took the necessary precautions to prevent future cheating incidents. The Committee has never seen such stringent examination security procedures.117/ The Committee found the current training program to have excellent training procedures in place to provide the necessary guidance to training personnel on construction, administration (including proctoring), evaluation and interpretation of examinations. These measures facilitate the proper administration of examinations and thereby reduce the opportunity, the feasibility and the temptation to cheat. The Licensee went further, however, and considered other ways to ensure itself that its training program was satisfactory. For example, numerous communication lines have been established between the Operations and Training Departments in response to cheating. See ¶¶ 65-75, supra. Individuals responsible for the TMI-1 licensed operator training program at the time of the cheating

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117/ GPU Nuclear's response to cheating is more fully discussed in ¶¶ 64-96, supra.

feel a keen sense of responsibility for the cheating that occurred, and the training organization is firmly dedicated to ensuring that it does not happen again. See ¶¶ 46-63, supra. The Committee therefore testified that in its opinion GPU Nuclear has properly responded to the problems in its training program identified internally and/or by the NRC decisions in this case. Committee, ff. Tr. 31,749, at 29.

293. The Committee determined that it would not be feasible or useful to attempt to determine what each member would have thought had they known that conditions existed that subsequently permitted cheating to occur on NRC and Licensee exams. Therefore, in the Special Report the Committee focused instead on the current TMI-1 licensed operator training program. In its view, this was the most effective approach, given the passage of four years and the fact that the OARP, for which its original Report was prepared, was a one-time program that has been succeeded by subsequent developments. Id. at 6.

294. The Committee testified at length about the status of the current licensed operator training program with respect to the remanded issues. The Appeal Board has asked whether the deficiencies in operator testing, as manifested by the cheating episodes, may be symptomatic of more extensive failures in the licensee's overall training program, and

whether those deficiencies have been remedied. ALAB-772, supra, 19 N.R.C. at 1233. The Committee answered these questions by evaluating, to the extent possible, the steps that have been taken by, and the performance of, the GPU Nuclear operator training program during the four years since its initial Report was issued. The answers to such questions do not depend upon a single activity, a single event, a single success, or a single failure. Rather, as the Committee testified, the answers depend upon the existence at TMI of a systematic preparedness to address problems and events that occur. Committee, ff. Tr. 31,749, at 7. Based on its findings, summarized below, the Committee found such a systematic preparedness to exist at TMI.

b. Training Resources

295. The T&E Department services TMI, Oyster Creek and corporate headquarters in Parsippany, with 108 staff members plus six contractors and its impressive 1984 budget of $7.3 million, which is about an order of magnitude increase in both staff and budget since the TMI-2 accident. The Committee was impressed with the large resources assigned to training of nuclear plant and support personnel, which it considers to reflect the commitment of GPU Nuclear top management to excellence in training. Committee, ff. Tr. 31,749, at 7.

296. The Committee felt that the primary basis upon which it could assess whether Licensee's assignments of training managers is appropriate was to assess the quality and performance of the program. In its Special Report, the Committee stated that it did not consider it appropriate to second-guess GPU Nuclear's management decisions, after the cheating incidents were uncovered, on the assignment of individuals to positions in the company. The Committee subsequently did, however, review the qualifications of T&E management in addition to the discussions it held with Mr. Clark on the propriety of the current management assignments. ¶¶ 236, 246, supra. The Committee also testified that its view, implicit in the Special Report, is that the cheating that occurred was not a reflection on the moral character of any of the individuals in charge of the operator training program at the time of the cheating incident, although they of course shared in the responsibility for the occurrence of cheating on company exams. The Committee found that training management accepted this responsibility, and was firmly dedicated to ensuring that cheating does not recur. In general, it was the Committee's view that, as regrettable as the cheating incidents were, they must not overshadow the extraordinary progress made by the T&E Department since the TMI-2 accident under the leadership of Dr. Long, Dr. Knief, Mr. Newton and, more recently, Dr. Coe and Mr. Leonard. Committee, ff. Tr. 31,749, at 8.

297. The Committee also believes that in an organization that is responsible for effective training on a broad scale (with operator, technician, engineer, management, and general employee training being administered), a special mix of management, education, and experience is most beneficial to the conduct of training operations. The Committee is of the view that the T&E management in place is performing very well and has been innovative and effective in development of the GPU Nuclear training programs. The individuals cited by the Appeal Board -- in particular, Dr. Long, and Mr. Newton and additionally Dr. Coe and Mr. Leonard (who were not cited) -- have the variety of backgrounds recommended in the 1980 OARP Committee Report. They possess the complementary skills and knowledge that, in the Committee's view, are essential to the smooth functioning and effectiveness of the GPU Nuclear training program. Id. at 9;118/ see ¶ 32, supra.

118/ The OARP Review Committee notes in its Special Report that the number of instructors assigned to operator training at TMI is nearly double the average number of similarly assigned instructors at other nuclear power plants in the United States. Committee, ff. Tr. 31,749, Special Report at 44. Moreover, the Committee states, "the fact that most of the TMI operator training instructors have or will hold either RO or SRO licenses or certificates provides invaluable knowledge and experience input to the training programs and establishes an all-important instructor credibility with the operators in training." Id.

300. Overall, the Committee endorsed the management responsible for the TMI licensed operator training program and the facilities available for use by operators in the program. Committee, ff. Tr. 31,749, at 8-10, 30; id., Special Report at 16-19, 82; Tr. 33,329-30, 32,079-80 (Kimel); 32,084 (Gardner); 32,080-81 (Christensen).

c. Programs and Procedures

301. In the Special Report, the Committee considered the issue of the adequacy of the current TMI licensed operator training program from several different vantage points. The Committee reviewed GPU Nuclear's responsiveness to the extensive recommendations in the areas identified by the OARP Review Committee in 1980. In this way, the Committee was able to evaluate substantive aspects of the current program and, as well, assess the commitment of the Company to the improvements the Committee endorsed four years ago. Tr. 31,943 (Uhrig). Chapter III of the Special Report summarizes each 1980 OARP Review Committee recommendation and GPU Nuclear response. In short, all of the Committee's recommendations have been seriously studied, and all but one recommendation, which the Company reviewed but did not implement, have been adopted and have been or are being implemented. The Committee testified that the following improvements are particularly pertinent to the

issue of adequacy of the TMI-1 licensed operator training program:

(1) Curricula incorporating (a) heat transfer, fluid flow, and thermodynamics, (b) small break LOCA, (c) transient training, including abnormal transient operating guidelines (ATOG) and (d) simulator training, incorporating depressurization and natural circulation have been developed and are included in the licensed operator training and retraining (requalification) program.

(2) Continuous, internal self-examination and periodic external reviews have been conducted at TMI. Currently, GPU is seeking INPO's accreditation of the TMI operator programs, including the TMI-1 licensed operator training program.

(3) GPU Nuclear has taken steps to ensure that the content and conduct of B&W's simulator programs are exactly what GPU Nuclear considers necessary and appropriate, are complementary to other operator training and, where feasible, are responsive to changes that occur in the TMI-1 control systems, plant design and procedures.119/

119/ Dr. Christensen testified that during one of his visits to the B&W simulator he observed the rapid alteration of the simulator instruction to reflect a plant design change which had been made only two or three days beforehand. Tr. 33,288-89 (Christensen). Mr. Kelly further testified that the PSI (B&W) instructors are always very careful to use TMI procedures. Tr. 32,068 (Kelly).

(4) GPU Nuclear has secured and placed into operation a Basic Principles Training Simulator (BPTS) built to its own specifications and based on its own studies. GPU Nuclear has also ordered a replica simulator for TMI-1 which will be delivered in late 1985. Additionally, an actual size TMI-1 control board mockup, has been installed in the TMI training building.

(5) As previously discussed, a program for instructor development has been implemented since the fall of 1980. The program includes such topics as curriculum development, development of behavioral learning objectives, preparation of lesson outlines and lesson plan formats, utilization of audio-visual aids, instructing/teaching techniques, preparation of examinations, evaluation techniques, and counseling techniques.

(6) Decision analysis training is included as part of senior reactor operator training. The original program offered in 1980 by Management Analysis Corporation has been modified and has become an integral part of the initial SRO training program.

(7) GPU Nuclear has developed guidance for the preparation of examinations. This guidance includes a matrix of content (knowledge) and type of response (skill or ability) required to answer the written examination questions.

(8) GPU Nuclear has worked with INPO in the preparation of a generic task analysis list for utilities that have operating nuclear plants. T&E used the INPO task analysis in the development of the BPTS program. The applicable INPO/B&W task analyses also were used to upgrade the specifications for the classroom and on-the-job training (OJT) portions of the operator training programs.

(9) GPU Nuclear management philosophy with respect to nuclear power plant operation and responsibilities to the public has been well developed and has been disseminated to GPU Nuclear personnel through a variety of memoranda and corporate publications. Id. at 12-14.

302. In summary, it is the Committee's view that GPU Nuclear's commitment of additional resources and the dedication to building a quality licensed operator training progarm for the TMI-1 operators since the issuance of the 1980 OARP Review Report (or for that matter since the Licensing Board's 1981 and 1982 management decisions) has been impressive. Id. at 14-15.

303. The Committee also testified that it reviewed information on the current status of licensed operator training, independent of its prior recommendations. In the last several years, the TMI-1 licensed operator training program has been enhanced in a number of ways. Id. at 15.

304. The Committee believes that the BPTS is the most advanced basic principles trainer for licensed operators in the United States. Furthermore, GPU Nuclear is one of only three U.S. utilities of which the Committee is aware that gives its operators training on both a BPTS and a full-scale (B&W) simulator. Id. at 15; see ¶¶ 44-49, supra.

305. In addition to the BPTS program, GPU Nuclear has an extensive simulator and plant evaluation drill program. Special B&W simulator training programs have been developed to provide operators experience with the use of major TMI procedural changes, (e.g., ATOG), steam generator tube rupture emergency procedures, and other Licensee Event Report (LER) lessons learned. The B&W simulator is used for initial training, maintenance of skills and special training requirements. Quality control is exercised by the Training Department over the content of the program. It is also used, contemporaneously, by senior members of TMI Operations staff to assess operators' capabilities. Moreover, as part of hot functional testing, operators have been provided with experience in the operation of certain systems. Committee, ff. Tr. 31,749, at 16.

306. The mock-up TMI-1 control board procedures trainer has been installed at the Training Center. Among other purposes, see ¶ 51, supra, it is used to further enhance the

effectiveness of ATOG procedural training. Licensed operators review the ATOG procedures with instructors and perform a step-by-step walk-through of each procedure and reference the actual controls displayed on the mock-up panels. Committee, ff. Tr. 31,749, at 17.

307. The Training Department utilizes instructor lesson plans to conduct all of its training sessions. These plans require management approval before being used. As a means of maintaining Operations Department feedback to the training process, weekly meetings with shift operators and the Training Department are held to review all program revisions and schedules and to resolve any special problems that may arise. Id. at 17-18.

308. GPU Nuclear has produced and published the Operations Plant Manual ("OPM"), a multi-volume technical reference document intended to cover all systems and major components in TMI-1, as well as fundamentals and theory necessary to understand the operation of power plant systems and equipment. Id. at 18; see ¶¶ 74, 113, 176, supra. The Committee testified that it is used by operators and instructors as a valuable reference document. Each section contains behavioral learning objectives for auxiliary operators, RO's and SRO's, and is written from an operator's viewpoint. Much of the detailed

engineering information typically found in system descriptions, but unnecessary for operator training, has been omitted. To date, over 100 of the 121 OPM sections have been issued, with the remainder in various stages of preparation, review and printing. Every section has been reviewed by the appropriate technical organization for completeness, accuracy, and for appropriateness of the learning objectives. Id. at 18.

309. Mr. Kelly and Dr. Gardner reviewed all of the Cycle 9 (1982) and Cycle 10 (1983) requalification exams (key with questions and answers to results), as well as all of the exam construction and implementation procedures. Committee Rebuttal, ff. Tr. 33,320, at 3, 13; Tr. 31,882-84 (Kelly); See ¶ 250, supra. Pooling their educational and nuclear technological expertise, they conclude that the scope and content of these written examinations, along with oral exams, simulator exercises, and on-the-job evaluations, were adequate to judge the effectiveness of the training program and that the operators have maintained high levels of qualification. Committee, ff. Tr. 31,749, at 21; Tr. 31,863 (Kelly). Each annual requalification training program reinforces and builds upon the previous knowledge of the operators; the requalification examinations, which are designed to test this knowledge, cover pertinent subject matter and are structured to measure retained knowledge of technical subject matter. Id.

310. The Committee further testified that reexaminations on much of the same subject-matter, which is required by the requalification process, is inevitably going to result in the experienced examinee's familiarity with key issues on which he should and will be examined. In addition to written examinations, an oral examination is used to assure that operators have a thorough understanding of the subject-matter. GPU Nuclear has included in its training program for instructors a seminar on test construction. Seminar participants developed a taxonomy of learning objectives and use it to evaluate examinations in terms of a two-dimensional blueprint that includes both content and the variety of types of mental processes needed by the examinee. More recently, sessions on this matter have been incorporated into the Fundamentals of Instruction course. Following such a blueprint will ensure that test questions will sample more broadly the kinds of mental operations that are required for a demanding job such as that of the control room operator, and will not simply encourage memorization for test-taking purposes. Id. at 19.

311. Following the TMI-2 accident, the NRC, INPO, and the industry committed resources to an analysis of what an operator needs to know to operate nuclear power plants safely and effectively. INPO's task analyses, initially issued in 1981 and updated periodically, were used by GPU Nuclear in the

development of TMI-1 job analyses. These analyses for the job of control room operator are now complete. Tr. 33,330 (Kimel); Tr. 32,455 (Newton). The use of task analyses in the development of the training curriculum will further enhance the licensed operator training program. Committee, ff. Tr. 31,749, at 18-19.

312. The format and content of the examinations are designed to test the specific skills and knowledges established as behavioral learning objectives in the performance-based training program. Both informal job and task analyses done by the GPU Nuclear staff and a set of task analyses constructed by INPO have been used. The written, oral and B&W simulator examinations are part of GPU Nuclear's overall appraisal of a potential operator's competence to function safely in the TMI-1 control room. The entire evaluation process involves: (1) classroom activities with lectures, quizzes, and examinations, (2) simulator exercises involving the solution of problems related to the transient behavior of the system, and (3) on-the-job performance and evaluation. These three components are integrated so that the required skills and knowledge can be tested appropriately, and the extent of each examinee's understanding can be ascertained reliably. Id. at 20.

313. All TMI training programs, including, of course, the licensed operator training program, are subject to auditing by GPU Nuclear management. For example, the licensed operator shifts undergoing requalification training on the B&W simulator are observed at least once during each cycle by one of the Emergency Directors (Messrs. Hukill, Toole, Ross and Colitz) and by the Vice President of Nuclear Assurance, or the Director of T&E. In addition to providing management with information, and a different perspective, on the effectiveness of the training program, the audits provide the operators with the confidence that management is truly concerned that the training activities are carried out effectively. Id. at 21; cf. Committee, ff. Tr. 31,749, Special Report at 76.

314. An extensive program for the training and further development of instructors has been undertaken by GPU Nuclear. The Committee testified that this program is being conducted in accordance with a strategy developed by the Director of Training and Education, Dr. Coe. A standardized method for instructor development and the conduct of effective performance-based training is in use, with a number of guidance documents developed to aid in the systematic pursuit of performance-based instruction. Thus, for example, a detailed rating sheet permits the evaluation of an instructor on a number of the important factors related to teaching, such as

familiarity with technical information, adequate preparation and presentation of materials, establishment of sound learning objectives, selection of appropriate instructional methods, proper use of instructional aids, proper treatment of explanations and questions, classroom management, and instructor characteristics such as voice, diction, enthusiasm, and appearance. There is also a rating sheet for the evaluation of examination administration.120/ Committee, ff. Tr. 31,749, at 10-11.

315. In addition, the Committee described a number of specific steps that have been taken to further ensure that qualified instructors are selected and that their skills improve on-the-job. These steps include (i) adoption of a formal Instructor Mode of Progression that clearly outlines the criteria for instructor job descriptions and specifications; (ii) instructor development modules offered as on-going programs administered uniformly by the Manager of Educational Development; (iii) required regular instructor evaluations by training management; (iv) unannounced documented classrcom

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120/ Mr. Kelly testified that the operators that he interviewed are very pleased with the quality of the GPU Nuclear and PSI (B&W) instructors; and that they are also quite satisfied with the instructors' attitude toward them. Tr. 32,068-69 (Kelly). Moreover, Dr. Kimel and Mr. Kelly were impressed by the high quality of instruction they observed during their classroom observations. Tr. 31,909 (Kimel); see also Tr. 32,084-85 (Gardner).

visits by the Vice President/Director of Nuclear Assurance and the Director of Training and Education; (v) a plan for the consolidation of appropriate GPU Nuclear training programs; (vi) licensed instructors making required and routine visits to the plant; (vii) off-site programs for educational and career development; (viii) regular staff meetings to discuss current company and educational issues; and (ix) formation of a GPU Nuclear Training Advisory Council that meets regularly to advise the Director of T&E on broad educational and personnel issues. Id. at 11-12.

316. Committee members, particularly Dr. Gardner and Mr. Kelly, reviewed the licensed operator instructors' resumes and performance evaluations, attended some classes and talked to several operators about the quality of the licensed operator instruction at TMI-1. The Committee is satisfied that the educational, technical and more subtle attitudinal quality of instruction is very good. It also is confident that GPU Nuclear is striving continually to maintain and improve its instructor capabilities through its educational development programs. Committee, ff. Tr. 31,749, at 30; ¶¶ 252-253, supra.

317. In summary, the Committee found that during the period of time that has elapsed since the 1980 OARP Review Committee Report and testimony presented by other licensee

consultants, the TMI-1 licensed operator training and requalification programs have been significantly improved. Additionally, there continues to be a strong GPU Nuclear management commitment to training. Since the OARP Review Report was issued in 1980, most of the Committee's recommendations have been carried out, and the strongest aspects of the OARP have been developed further and incorporated in the current training program. The present program is superior to the OARP training program. Management has actually devoted considerable additional resources to training, as well as to systematically developing procedures that promote an effective program. The Committee, moreover, believes that the training programs currently conducted at TMI enhance the Licensee's ability to maintain licensed operator competence. In short, the Committee believes the present training program strongly supports the restart of TMI-1. Id. at 18, 22.

d. Communications

318. Based on discussions with a variety of GPU Nuclear personnel and a corroborative review of documents, the Committee found extensive evidence of effective communications between company management and the persons involved in the licensed operator training program -- both operators and training staff. There are a number of ways in which these open

channels of communication are fostered. The Special Report notes the following lines of communication: (1) formal interviews with operators by the Vice President/Director of TMI-1, Mr. Hukill, see ¶ 67, supra; (2) operator certification procedures requiring Operations and Training Department performance and attitude evaluations; (3) Mr. Hukill's attendance of training classes at least four-hours per month; (4) bi-weekly management reports from each division to senior GPU Nuclear management; (5) periodic meetings by Mr. Hukill with operators and by the Vice President of Nuclear Assurance, Dr. Long, with training personnel; (6) management and supervisory development programs; (7) weekly off-shift tours by management; (8) attendance by senior managers from Nuclear Assurance, Operations and Training at the B&W simulator; (9) approval of operator training programs, including schedules and content, by Operations management prior to their implementation and regular meetings between Operations and Training to discuss common issues of interest; (10) meetings between shift management from week to week during requalification training in order to improve the program as it is retaught; and (11) attendance by the Manager of Plant Training, Mr. Newton, at Mr. Hukill's managers' meetings. Id. at 22-23.

319. The Committee also found that GPU Nuclear's top management has emphasized the need for and encouraged the

development of strong communication channels within the Company. A number of corporate memoranda and staff meetings bear out this finding. The necessity for GPU Nuclear employees to act honestly, responsibly and cooperatively also has been stressed by the company. Id. at 23.

320. After examination of the evidence, the Committee has confidence in GPU Nuclear management's current awareness of the real and perceived problems of its employees. It has in place working and demonstrably effective communication practices between top managment and the operating crews.121/ Id. at 24.

321. With respect to operator attitudes, the Committee testified that it observed operators and candidates in the control room and at the B&W simulator. As our earlier discussion on methodology demonstrated,122/ the Committee has taken advantage of a number of opportunities to individually discuss training with numerous licensed operators, including all six shift supervisors. The Committee is also aware of the various

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121/ Dr. Kimel testified that the barrier between management and the operators no longer exists due to the open lines of communication which allow operators to address their concerns regarding the training program or job performance with management. Tr. 31,975-77 (Kimel).

122/ See ¶¶ 227-257, supra.

processes and procedures in place to ensure that operator views and criticisms of training are aired, responses provided, and appropriate actions implemented.123/ It is the Committee's impression, based on the observations and assessments it has made, that the operators recognize the value of and have respect for the licensed operator training program, recognize and accept their responsibility as licensed operators to participate in the program, and believe that it is an effective program. Committee, ff. Tr. 31,749, at 31.

322. After a thorough consideration of the issue, the Committee concluded that the licensed operator training program at TMI-1 is an effective program and will continue to qualify individuals to safely operate TMI-1. The Committee thus reaffirmed the conclusions reached in its Special Report and, in particular, the findings from that Report that the Committee highlighted in its testimony. Id. at 31.

123/ Mr. Kelly testified that operator attitude toward requalification training and annual requalification examinations is much more positive at TMI than the general resentment of the requalification process that pervades the industry. Tr. 32,170-71 (Kelly). He attributes the better disposition of the TMI operators to the open communications channels between Training and Operations which allow operators to request and receive improvements in training. Id.

4. Summary and Conclusions

323. An extensive record has been developed concerning the adequacy of the TMI-1 licensed operator training program and the Reconstituted OARP Committee's review thereof. Both the Staff and UCS presented testimony outlining their proposed methodologies for reviewing the training program. Neither proposed methodology was shown to be superior to the methodology used by the Committee when it reviewed the licensed operator training program. We have carefully reviewed the differences that exist between the three methodologies and find nothing that would indicate that the Committee's review of the training program was in any way inadequate to allow it to address knowledgeably the remanded issues before us. We are mindful that the Committee did not attempt to conduct, nor should it have conducted, an accreditation of the training program; instead it embarked on an extensive review of the training program to allow it to address the Appeal Board's remanded issues. This review was a follow-up to the baseline 1980 assessment done by the OARP Review Committee. We are confident that the Committee's review met and exceeded that threshold level of review. We, therefore, find that the Committee's methodology used to assess the TMI-1 licensed operator training program is adequate to support its findings concerning that program. Moreover, the Committee's findings, which are

very favorable, are fully consistent with the evidence presented in this proceeding on licensed operator training at TMI-1.

III. CONCLUSIONS OF LAW

324. In accordance with the Appeal Board's decision in ALAB-772 remanding the issue of licensed operator training for further hearings, and based on the extensive evidence presented during the remanded proceeding, including the specific expert views of the OARP Review Committee members, the Board concludes that licensed operator training at TMI-1, including the management, staff, facilities, programs and procedures, is adequate to train operators to operate TMI-1 safely. The Board further concludes that the issues in the remanded proceeding on training have been resolved in favor of restarting TMI-1.

Respectfully submitted,

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