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NUCLEAR REGULATORY COMMISSION ISSUANCES

August 1985



U.S. NUCLEAR REGULATORY COMMISSION

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Vol. 22, No. 2
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NUCLEAR REGULATORY COMMISSION ISSUANCES

August 1985

This report includes the issuances received during the specified period from the Commission (CLI), the Atomic Safety and Licensing Appeal Boards (ALAB), the Atomic Safety and Licensing Boards (LBP), the Administrative Law Judge (ALJ), the Directors' Decisions (DD), and the Denials of Petitions for Rulemaking (DPRM).

The summaries and headnotes preceding the opinions reported herein are not to be deemed a part of those opinions or to have any independent legal significance.

U.S. NUCLEAR REGULATORY COMMISSION

Prepared by the Division of Technical Information and Document Control,
Office of Administration, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555
(301/492-8925)

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Commission
Issuances

COMMISSION

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Nunzio J. Palladino, Chairman
Thomas M. Roberts
James K. Asselstine
Frederick M. Bernthal
Lando W. Zech, Jr.

In the Matter of

Docket Nos. 50-275-OL
50-323-OL

**PACIFIC GAS AND ELECTRIC
COMPANY**

(Diablo Canyon Nuclear Power
Plant, Units 1 and 2)

August 1, 1985

The Commission authorizes the issuance of a full-power operating license for the Diablo Canyon Nuclear Power Plant Unit 2 upon finding that all matters have been adequately resolved and denies the Joint Intervenors' request to stay the effectiveness of such authorization for failure to meet the stay criteria in 10 C.F.R. § 2.788(e).

MEMORANDUM AND ORDER

INTRODUCTION

This Order concludes the Nuclear Regulatory Commission's ("NRC" or "Commission") consideration of whether to authorize the issuance to Pacific Gas and Electric Company ("PG&E") of a full-power operating license for the Diablo Canyon Nuclear Power Plant, Unit 2 ("Diablo Canyon Unit 2"). This consideration includes a conclusion of the formal

proceeding on contested issues regarding Diablo Canyon Unit 2 as well as affirmative findings on the successful resolution of uncontested issues. The Commission, for the reasons discussed below, finds that all matters have been resolved adequately to authorize the issuance of a full-power operating license for Diablo Canyon Unit 2.

DISCUSSION

ALAB-811

In ALAB-811 (21 NRC 1622 (1985)), the Appeal Board determined that no further hearings were necessary to resolve the design issues with respect to Unit 2 and found that the Unit 2 verification program was sufficient to establish that the design of Unit 2 was satisfactory and that therefore there was reasonable assurance that Unit 2 could be operated without endangering the health and safety of the public. A petition for Commission review of that decision was then filed. The Commission has reviewed this petition but finds it to be without merit. Accordingly, it is denied.

Stay Request

By letter dated July 24, 1985, the San Luis Obispo Mothers for Peace, *et al.* ("Joint Intervenors") applied to the Commission for an order staying the effectiveness of any authorization by the Commission of the issuance of a license for full-power operation of Diablo Canyon Unit 2. In attempting to meet the stay criteria,¹ the Joint Intervenors advance three arguments in support of their likelihood of prevailing on the merits: (1) the failure of the Commission to permit consideration of seismic effects on emergency planning; (2) the refusal of the Appeal Board, in ALAB-782 (20 NRC 838 (1984)), to reopen the record to consider new information which allegedly undermines the Appeal Board's findings in ALAB-644, 13 NRC 903 (1981); and (3) an allegation that the Appeal Board's decision in ALAB-811, approving the design adequacy of Unit 2, is not supported by substantial evidence.

The Commission has already fully considered the question of whether its regulations or special circumstances require consideration of the

¹ The factors prescribed by 10 C.F.R. § 2.788(e) to be considered in connection with a request for stay are:

- (1) Whether the moving party has made a strong showing that it is likely to prevail on the merits;
- (2) Whether the party will be irreparably injured unless a stay is granted;
- (3) Whether the granting of a stay would harm other parties; and
- (4) Where the public interest lies.

effect of seismic events on emergency planning at Diablo Canyon in the context of the full-power licensing of Unit 1. See CLI-84-12, 20 NRC 249 (1984). This matter was the subject of a petition for review to the United States Court of Appeals for the District of Columbia Circuit and is scheduled for rehearing *en banc*.² Under 28 U.S.C. § 2347(c) the Commission should not, without judicial approval, reconsider a decision after the filing of a petition for judicial review.³ Moreover, the Court, in the same Order, explicitly declined to stay the operating license pending the rehearing *en banc*. Thus the full Court did not regard the reopening of this issue as warranting a stay of the license.

The Joint Intervenors assert that new seismic information calls into question the Appeal Board's conclusion, in ALAB-644, that the seismic design criteria for Diablo Canyon are adequate. The Joint Intervenors moved the Appeal Board to reopen the record to consider this information but a majority of the Board ruled in ALAB-782 that the motion could not be considered for lack of jurisdiction. The Commission has declined to review that decision. The fact that the adjudicatory record was not reopened does not mean that this information has been ignored by the Commission. On the contrary, the Commission, in its order authorizing a full-power license for Diablo Canyon Unit 1, CLI-84-13, 20 NRC 267, 275-78 (1984), itself reviewed the same new geological information presented in the reopening motion and found that it did not undermine ALAB-644. Consequently, had the Joint Intervenors submitted their motion to the Commission, the Commission would have found that the reopening standard was not met. Finally, the Commission has included a condition in the license for Unit 1 requiring that the Pacific Gas and Electric Company (PG&E) conduct a seismic reevaluation, thus assuring that the seismic design of Diablo Canyon will be subject to continued scrutiny.

Finally, the Joint Intervenors allege that the Appeal Board's decision in ALAB-811, approving the adequacy of design of Unit 2, is not based on substantial evidence and thus the Commission can have no reasonable assurance that Unit 2's design is consistent with Commission regulations. The scope of the Unit 2 verification program had been placed on the record at the hearings leading to the Board's decision in ALAB-763, 19 NRC 571 (1984). The results of that program, however, were not addressed because it was yet ongoing at that time. In ALAB-811, the Board rejected the Joint Intervenors' position that this reason alone necessitated further hearings. In addition to the evidence on the scope

² *San Luis Obispo Mothers for Peace v. NRC*, No. 84-1410 (May 1, 1985).

³ See, e.g., *American Farm Lines v. Black Ball Freight Service*, 397 U.S. 532, 540 (1970).

of the Unit 2 verification program, the record contained detailed evidence of the extent and the results of the Unit 1 verification program. Thus there was sufficient evidence in the record to make findings as to the adequacy of the design of Unit 2 given the virtual identity of design of the two units.

In sum, the Joint Intervenors have not established that they are likely to demonstrate a lack of reasonable assurance that the seismic design is adequate. With respect to the other factors of the stay criteria, Joint Intervenors assert that they will suffer irreparable injury because they are put at risk by full-power operation and because it may become more difficult or more costly to adopt any necessary modifications to the plant. Mere exposure to risk, however, does not constitute irreparable injury if the risk, as here, is so low as to be remote and speculative and any difficulty or expense in adopting necessary modifications is not an injury to Joint Intervenors. Moreover, the harm to others posed by even a short delay in permitting operation of a fully constructed and tested nuclear power plant is not *de minimis* in terms of its economic effect on the licensee and its ratepayers. The Commission has determined that there is reasonable assurance that the activities authorized by the operating license can be conducted without endangering the health and safety of the public, and that such activities will be conducted in compliance with Commission regulations and the license. In these circumstances, the public interest lies in the use of this plant and in the orderly functioning of the regulatory process. Accordingly, the request for a stay is denied.

Allegations

Since 1983, the Commission has received numerous allegations regarding alleged deficiencies in the design, construction and operation of both units of the Diablo Canyon facility and the licensee's management of those activities. All allegations have been handled by the Diablo Canyon Allegation Management Program ("DCAMP") which is described in Supplements 21 and 22 to the Safety Evaluation Report ("SSER" 21 and 22). See CLI-84-13, *supra*, 20 NRC at 273. The status of allegation resolution as of July 8, 1984, was reviewed in SSER 26 and considered by the Commission prior to its authorizing the issuance of a full-power operating license for Diablo Canyon Unit 1. 20 NRC at 273-74.

Since then DCAMP has made substantial additional progress in resolving allegations. In SSER 28, the Staff reported on the status of allegations received through March 1, 1985, and discussed the Staff's review of

these allegations through March 31, 1985.⁴ The Staff's preliminary ("screening") review of all of those allegations indicated that none of them is of sufficient safety significance to preclude the continued operation of Diablo Canyon Unit 1 or the full-power operation of Diablo Canyon Unit 2. The Staff has evaluated the allegations in sufficient detail to determine that even if they ultimately prove correct, failure to resolve them would not significantly affect public health and safety. SSER 28 at 4-1.⁵ Since making that report, the Staff, at the Commission meeting of August 1, 1985, has updated the status of the resolution of pending allegations and reaffirmed its previous conclusions. Under these circumstances, the Commission finds no reason to defer full-power operation of Diablo Canyon Unit 2 pending the formal resolution of the remaining outstanding allegations.

Internal Review Program

PG&E initiated an Internal Review Program (IRP) for Diablo Canyon Unit 2 to determine whether concerns raised regarding Diablo Canyon Unit 1 were applicable to Unit 2 and whether the concerns identified as being applicable to Unit 2 were resolved adequately. These concerns included all matters considered by the Independent Design Verification Program ("IDVP"), the PG&E Internal Technical Program ("ITP") and issues raised by the NRC Staff for Unit 1. The NRC Staff has evaluated the programmatic and technical aspects of the IRP. In addition, the Staff has independently audited and evaluated the seismic design of certain civil structures and systems for Diablo Canyon Unit 2.

The Staff reported the results of these evaluations in SSER 29. All but two items were found to have been satisfactorily completed for full-power operation. Those two items, analysis of the shear friction along a construction joint in the turbine building and the seismic analysis of the pipeway, have now been completed satisfactorily.

Piping Systems and Pipe Supports

The NRC has conducted a broad-based technical review and evaluation of the design and analysis of piping systems in Diablo Canyon Unit

⁴ DCAMP has been modified to include the referral of some allegations to PG&E for resolution. The Staff's allegation Review Board reviewed PG&E's responses and has audited PG&E's resolutions. They were found to be adequate. SSER 28 at 3-1.

⁵ Of the 1665 allegations reviewed, 1407 were found applicable to Unit 2. Of those, 1147 have been found resolved. Additional allegations submitted by letter dated March 14, 1985, are currently being screened in accordance with the criteria set out in the Commission's Policy Statement of March 19, 1985. 50 Fed. Reg. 11,030.

2. The review was conducted by a special Review Team composed of members of the NRC Staff and consultants from national laboratories and private companies. The purpose of this effort was: (1) to determine whether safety-related piping and supports in Unit 2 had been properly evaluated; and (2) whether the piping and support issues raised by Unit 1 found applicable to Unit 2 had been considered and resolved.

The NRC Staff has reported the results of the review and evaluation in SSER 30. Some concerns were identified during the evaluation. All have been resolved or determined not to be of safety significance. The Review Team determined that issues which pertained to Unit 1 piping and pipe supports and were applicable to Unit 2 have been satisfactorily addressed and resolved for Unit 2. Based on this evaluation, the Staff has concluded that Unit 2 meets all applicable licensing criteria in this area.

Miscellaneous Matters

In addition to the specific issues discussed above, the NRC Staff has addressed in SSER 31 twenty-one items or classes of items which were pertinent to the low-power licensing decision on Diablo Canyon Unit 2. As a result of that review, the Staff identified eleven items or classes of items requiring further action prior to a full-power operating license for Unit 2. The Staff now has reported that all of these items have been addressed satisfactorily for the purposes of full-power operation.

Operating Experience

The Staff has reported that Diablo Canyon Unit 2 for the first 2 months of operation at low power had a more favorable operating record than any other recently licensed plant operated at low power. In particular, there were no events reportable under 10 C.F.R. § 50.72 nor was any Licensee Event Report ("LER") issued. This is to be compared with an average of eight reports under § 50.72 and seven LERs for seven recently licensed pressurized water reactors. In the last month, only two minor reportable events occurred. While this may be explained, in part, by the fact that Unit 2 did not reach criticality during this period, and some improvement in attention to detail may be warranted, the experience to date is still excellent.

CONCLUSION

For the reasons set out above, the Commission has determined that the full-power license for Diablo Canyon Unit 2 may be issued by the Director, NRR. Joint Intervenors have requested a brief stay of the effectiveness of this Order to permit the orderly processing of a request for judicial review. However, PG&E has informed us by letter of July 26, 1985, that the low-power test program will not be completed until August 16, 1985. Thus, there is no need for a stay in order to assure orderly judicial review, and, accordingly, we decline to stay the effectiveness of this licensing decision.

It is so ORDERED.

For the Commission

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.,
this 1st day of August 1985.

SEPARATE VIEWS OF COMMISSIONER ASSELSTINE

I dissent from this Order. I would not grant PG&E a license to operate Diablo Canyon Unit 2. My reasons for voting against issuance of the license are the same reasons I voted against the issuance of an operating license for Diablo Canyon Unit 1. Those reasons have been set out in detail in CLI-84-12 and CLI-84-13 so I will not repeat them here. See *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-84-12, 20 NRC 249 (1984); CLI-84-13, 20 NRC 267 (1984).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Nunzio J. Palladino, Chairman
Thomas M. Roberts
James K. Asselstine
Frederick M. Bernthal
Lando W. Zech, Jr.

In the Matter of

Docket Nos. 50-352-OL
50-353-OL

PHILADELPHIA ELECTRIC COMPANY
(Limerick Generating Station,
Units 1 and 2)

August 8, 1985

The Commission addressed all the comments raised by the Graterford inmates and found that neither these comments nor the Staff briefing raised any issues which warranted staying effectiveness of the Licensing Board's authorization for issuance of a full-power license for Limerick Generating Station, Unit 1. Accordingly, the Commission made the authorization immediately effective.

MEMORANDUM AND ORDER

On July 22, 1985, the Atomic Safety and Licensing Board ("Licensing Board") issued its Fourth Partial Initial Decision ("PID") which resolved all remaining contested issues in favor of the Licensee, Philadelphia Electric Company ("PECo"), and authorized the Director, Office of Nuclear Reactor Regulation ("Director") to issue PECO a full-power

operating license for the Limerick Generating Station ("Limerick"). Comments on that PID were submitted by the inmates of the State Correctional Institution at Graterford, Pennsylvania ("inmates"). The Commission has reviewed the PID and the inmates' comments on it in accordance with the criteria in 10 C.F.R. § 2.764(f)(2).² For the reasons stated below, the Commission finds no reason to stay the effectiveness of the PID.

The inmates raised both procedural and substantive concerns. First, the inmates contend that their hearing rights were infringed. They support this assertion with a recitation of previous procedural rulings by the Licensing Board. The inmates' concerns in these areas were addressed by the Commission in CLI-85-11, 21 NRC 1585 (1985), and by the Atomic Safety and Licensing Appeal Board in the course of appellate review, ALAB-809, 21 NRC 1605 (1985). Remedial actions were taken in these decisions to protect the inmates' rights. Accordingly, the actions complained of do not serve as a basis for delaying effectiveness.

The inmates also asserted that the expedited schedule for discovery and filing proposed findings of fact and conclusions of law in the recent hearing violated their rights under the NRC regulations. However, the record shows that the inmates agreed to this schedule in a telephone conference before commencement of discovery (Tr. 20,722-47) and did not express any objections until the hearings were under way (Tr. 20,902). Therefore, we believe they have waived any objection on this issue.³

The inmates also contended that the Licensing Board erred in rejecting several of the bases supporting their contention. The inmates submitted one general contention with eight bases. The Licensing Board admitted the contention but limited the hearing to two of the stated bases. The

¹ By a previous Memorandum, CLI-85-13, 22 NRC 1 (1985), the Commission addressed the Licensing Board's Second and Third PIDs and determined that nothing in the decisions or the comments of Limerick Ecology Action warranted staying the effectiveness of those decisions. Nothing in this Order modifies those conclusions.

² The criteria in § 2.764(f)(2)(i) are:

- a. the gravity of the substantive issue;
- b. the likelihood that it was decided incorrectly below;
- c. the degree to which correct resolution of the issue would be prejudiced by operation pending review; and
- d. other relevant public interest factors.

³ Inmates also alleged that these rulings, taken as a group, demonstrate that the Licensing Board was inherently prejudiced and, therefore, denied the inmates a fair and impartial hearing pursuant to 10 C.F.R. § 2.718. If a party deems a member of a licensing board to be disqualified, the party may move that member to disqualify himself. 10 C.F.R. § 2.704(c). Such a motion must be supported by affidavits setting forth the alleged grounds for disqualification. *Ibid.* These requirements are necessary because of the seriousness of such allegations. The inmates have not indicated which member or members they believe are prejudiced, have not moved the member or members to disqualify themselves and have not supported their allegations with affidavits. Therefore, this issue is not properly before the Commission.

other bases were rejected during the prehearing process for failure to satisfy the requirements in 10 C.F.R. § 2.714.⁴ We have reviewed the Licensing Board's decision on these matters and, for the reasons stated below, find no reason to stay effectiveness.

The inmates contended that the commercial telephone system might be overloaded during an emergency, and, therefore, would be unavailable to call up off-duty guards needed to effect evacuation of the prison. Accordingly, the inmates asserted that a backup system was required. This argument was rejected during the prehearing process as not raising a material safety issue suitable for evidentiary hearing. Our review of the RERP indicates that the Pennsylvania Bureau of Corrections (Bureau) has the capability of sending guards to Graterford from other correctional institutions. Such guards could be transported in the same buses which will be used to effect evacuation. It therefore appears that even if the off-duty guards from Graterford cannot be mobilized, other guards will be available to aid in any evacuation. Therefore, while we express no opinion regarding the suitability of this issue for hearing, the issue is not sufficiently grave to warrant delay in effectiveness.

The inmates also asserted that the medical arrangements in the event of an accident were inadequate. The Board provided an extensive explanation to indicate why the inmates' assertion lacked basis. Under the Commission's Emergency Planning Policy Statement, 50 Fed. Reg. 20,892 (1985) the Commission can find that it was sufficient for the Licensee to prepare a list of area hospitals capable of treating contaminated injured individuals, and for the Licensee to commit itself to comply with the Commission's upcoming response to the decision in *Guard v. NRC*, 753 F.2d 1144 (D.C. Cir. 1985). The Commission so finds. The Bureau has a list of hospitals and has agreements with a number of hospitals which are accredited. Such accreditation requires a capability of treating contaminated injured individuals. Under these circumstances, the Board's treatment of this issue does not raise a substantive issue of sufficient gravity to warrant a delay in effectiveness.

The inmates contended that the Licensing Board applied the wrong burden of proof in rejecting several issues for hearing. In particular, the inmates cite the handling of their contention that there is no reasonable

⁴ These bases were: (1) the telephone system would be overburdened during an emergency, impairing the ability to recall off-duty guards to effect evacuation; (2) the Correctional Officers Union did not provide input into the Radiological Emergency Response Plan (RERP); (3) the medical arrangements were deficient; (4) the laboratories which will assist in monitoring the plume were not identified in the RERP; (5) the exercise of the Graterford RERP did not test required scenarios and did not identify the Graterford officials by name; and (6) the RERP will not prevent the spontaneous evacuation of the guards or inmates.

assurance that the emergency plan for Graterford will prevent a spontaneous evacuation of the guards or inmates. The inmates object to the Board's assumption that the guards would do their duty and that the inmates would be restrained from evacuating spontaneously. However, we do not read this "assumption" as necessarily the sole reason for the Board's rejecting the issue for hearing. The basis proffered by the inmates for hearing this issue consisted of a list of past incidents at Graterford prison. However, none of the incidents contained any indication that the guards deserted or the inmates spontaneously evacuated. Accordingly, in our preliminary view, the inmates did not appear to offer adequate support for the issue that they sought to litigate. Under our rules, intervenors have the burden of providing reasonably specific issues and bases for litigating those issues. 10 C.F.R. § 2.714(b). Based on our preliminary review we cannot conclude that the Licensing Board erred in rejecting this issue.

We have also reviewed the Licensing Board's decision on the two bases which were admitted for adjudication. These were claims that: (1) there was not reasonable assurance that civilian bus and ambulance drivers would be offered training; and (2) the estimated time for evacuation of the Graterford Institution is unrealistically low. For the reasons discussed below, we find that the Licensing Board's decision on these matters does not present issues which warrant a stay of effectiveness.

In their effectiveness comments, the inmates do not challenge the adequacy of the offer of training, but now state that because no bus companies have responded to the Pennsylvania Emergency Management Authority's ("PEMA") April 4, 1985 letter offering to train their employees, the Licensing Board was wrong in finding reasonable assurance that such training will, in fact, occur. Inmates could have raised this issue in a timely manner before the Licensing Board. Having failed to do so, we also consider whether this information would warrant reopening the record. It would not. As the inmates note in their comments, PEMA has committed to visit personally all the bus and ambulance companies to encourage their drivers to accept the training. In addition, the RERP states that there will be trained Bureau personnel on each bus, so the sole function of the civilian drivers is to drive, which is their normal occupation. Accordingly, this matter does not warrant a stay of effectiveness.

As for the estimated time for evacuation, the inmates contend that methodology used in compiling the estimate was inaccurate. In support of this assertion the inmates' expert, Major John Case, testified that the evacuation could just as easily be 12 to 20 hours instead of the 8 to 10 hours derived by the Bureau of Corrections, but that if the Bureau

included a description of the events during a radiological emergency in the inmate handbook, the Bureau's estimate was as good as any. Tr. 20,936. The Bureau has committed itself to providing this description.⁵

The inmates' other major basis for asserting that the ETE is inaccurate is that it does not consider a combination of the effects of a general panic, severe weather conditions and radiological contamination due to adverse wind direction, and instead assumes ideal conditions. An NRC Staff consultant who participated in preparation of NUREG-0654 testified as a Staff witness that no such worst-case estimate was intended to be met for the ETE. He further explained that the ETE is used to assist decisionmakers in choosing appropriate action. Therefore, an estimate based on a rare combination of conditions would not accomplish this purpose and, in fact, could lead to an erroneous protective action decision. The record also reflects that the ETE was derived from the actual time it took transportation vehicles to travel the same routes in a variety of conditions, including rain and snow. Therefore, based on our preliminary review we cannot conclude that the Licensing Board erred as to approval of the 8- to 10-hour estimate. However, the NRC Staff should ensure that the ETE is inserted in the emergency plan.

For the foregoing reasons, the Commission believes that a stay of the effectiveness of the Licensing Board's Fourth PID is not warranted. This conclusion is based on a preliminary review, and is without prejudice to the Appeal Board's review of any of the issues pending before it, or to any further review by the Commission itself.

The Commission has also been briefed by the NRC Staff on the review of the uncontested issues for Unit 1 and is satisfied that the activities to be authorized by the operating license for Unit 1 can be conducted without endangering the health and safety of the public and that the activities will be conducted in compliance with NRC regulations and the terms of the license. Accordingly, the Commission authorizes the Director to issue to PECo a full-power operating license for the Limerick Generating Station, Unit 1.

At the Commission's meeting today, August 8, 1985, Limerick Ecology Action, an intervenor in this proceeding, orally requested the Commission to stay the issuance of the operating license for 14 days to allow time for judicial review. PECo has had a low-power license to operate up to 5% of rated power since October 1984. To increase operation to the

⁵ The inmates have asserted that this description would not be adequate because 60% of the population is illiterate and another 10% only speaks Spanish. The inmates did not raise this issue before the Licensing Board despite the opportunity to do so. Therefore, raising this new assertion at this time invokes the NRC's reopening criteria. They do not appear to be met here. Moreover, there is nothing offered to suggest why the inmates cannot get someone to read the information to them or receive the information in the event of an emergency via the Institution's public address system and closed-circuit television.

rate of full power authorized by today's Order will entail a gradual process of power ascension and testing over a period of months, and the expectation is that to complete the testing to exceed 20% of rated power will take approximately 11 days. The public health and safety risks of these low levels of power are far less than the theoretical risks of full-power operation. Nor is the level of contamination which results from such levels of operation significantly different than those associated with, and already reached as a result of, Limerick's low-power operation. Moreover, in the event that a stay is sought and ordered by a court, the utility can reverse this process and reduce power levels to below the 5% level.

LEA has offered nothing to balance against these facts. Moreover, LEA has not provided any legal arguments which would support a stay or made us aware of any significant legal issues that a reviewing court might have to resolve with regard to any judicially requested stay.

Accordingly, this Order is being made immediately effective by the Commission.

Commissioner Asselstine's separate views, concurring in the result, are attached.

It is so ORDERED.

For the Commission⁶

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.,
this 8th day of August 1985.

SEPARATE VIEWS OF COMMISSIONER ASSELSTINE

I concur in the result of the Commission's order, but not in the substance. I do not agree with some of the Commission's reasoning which is intended to bolster a less than perfect Licensing Board decision. However, none of the issues is significant enough that I would vote to prevent the issuance of a license pending completion of the merits review

⁶ Chairman Palladino was not present to vote on this Memorandum and Order.

of the initial decision. Further, I would have included in the order a brief "housekeeping" stay to permit an orderly application for judicial review of the Commission's decision.

Atomic Safety and Licensing Appeal Boards Issuances

ATOMIC SAFETY AND LICENSING APPEAL PANEL

Alan S. Rosenthal, Chairman
Dr. W. Reed Johnson
Thomas S. Moore
Christine N. Kohl
Gary J. Edles
Dr. Reginald L. Gotchy
Howard A. Wilber

APPEAL BOARDS

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Administrative Judges:

Christine N. Kohl, Chairman
Gary J. Edles
Dr. Reginald L. Gotchy

In the Matter of

Docket Nos. 50-352-OL
50-353-OL

PHILADELPHIA ELECTRIC COMPANY
(Limerick Generating Station,
Units 1 and 2)

August 13, 1985

The Appeal Board denies intervenors' motion for a stay of the Licensing Board's partial initial decision resolving the last contested issues in this operating license proceeding and authorizing the Director of Nuclear Reactor Regulation to issue a full power license for the Limerick facility.

**RULES OF PRACTICE: STAY OF AGENCY ACTION
(CRITERIA)**

The first criterion for a stay is a strong showing that the moving party is likely to prevail on the merits. A stay motion must also address three other factors: whether the movant will be irreparably harmed in the absence of a stay; whether the grant of a stay would harm any other party; and where the public interest lies. 10 C.F.R. § 2.788(e).

**RULES OF PRACTICE: STAY OF AGENCY ACTION
(CRITERIA)**

A party's failure to address the stay criteria set out in 10 C.F.R. § 2.788(e) may result in summary denial of a stay motion. See *Public Service Co. of Indiana* (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-493, 8 NRC 253, 270-71 (1978).

**RULES OF PRACTICE: IMMEDIATE EFFECTIVENESS OF
DECISION DIRECTING ISSUANCE OF OPERATING LICENSE**

Under the "immediate effectiveness" rule, unless the Commission otherwise directs, an immediate effectiveness determination by the Commission is without prejudice to the Appeal Board's determination of a stay motion pursuant to 10 C.F.R. § 2.788(e), or an appeal on the merits pursuant to §§ 2.762 and 2.785, or in any subsequent proceeding. 10 C.F.R. § 2.764(g).

**RULES OF PRACTICE: STAY OF AGENCY ACTION
(TIMELINESS
OF REQUEST)**

An application for a stay must be filed within ten days of service of the decision for which a stay is requested. 10 C.F.R. § 2.788(a).

**RULES OF PRACTICE: STAY OF AGENCY ACTION
(CRITERIA)**

In a motion for a stay, when attempting to show likelihood of prevailing on the merits, it is not sufficient simply to state confidence or an expectation of ultimate success. *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit 1), CLI-84-17, 20 NRC 801, 804-05 (1984).

**RULES OF PRACTICE: STAY OF AGENCY ACTION
(CRITERIA)**

Irreparable harm is often the most important factor in determining the need for a stay; a party must reasonably demonstrate, not merely allege, such harm. *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-794, 20 NRC 1630, 1633-35 (1984).

APPEARANCES

Robert L. Anthony, Moylan, Pennsylvania, intervenor pro se and for intervenor Friends of the Earth.

Frank R. Romano, Ambler, Pennsylvania, for intervenor Air and Water Pollution Patrol.

Troy B. Conner, Jr., and **Robert M. Rader**, Washington, D.C., for applicant Philadelphia Electric Company.

Benjamin H. Vogler for the Nuclear Regulatory Commission staff.

MEMORANDUM AND ORDER

By petition filed August 1, 1985, intervenors Robert L. Anthony/Friends of the Earth (Anthony/FOE) seek a stay of the Licensing Board's fourth partial initial decision (PID), LBP-85-25, 22 NRC 101 (1985). That decision, which addresses the last two contested issues in this proceeding (relating to the emergency plan for the State Correctional Institution at Graterford, Pennsylvania), authorizes the Director of Nuclear Reactor Regulation (NRR) to issue a full-power operating license for the Limerick facility to applicant Philadelphia Electric Company (PECo). Intervenor Air and Water Pollution Patrol supports the stay request, while PECO and the NRC staff oppose it. As explained below, we deny the stay.¹

A.

The first criterion for a stay is a strong showing that the moving party is likely to prevail on the merits. 10 C.F.R. § 2.788(e)(1). In an attempt to show this, Anthony/FOE claim that the Licensing Board could not properly authorize the Director of NRR to issue an operating license for Limerick because several matters that require Board findings prior to

¹ The Graterford inmates, also intervenors in this proceeding, previously sought a stay of the Board's fourth PID. Because they failed to address the stay criteria set forth in the Commission's Rules of Practice, 10 C.F.R. § 2.788(e), we summarily denied that motion in an unpublished order issued August 1, 1985. See *Public Service Co. of Indiana* (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-493, 8 NRC 253, 270-71 (1978).

license issuance remain outstanding. In this regard, intervenors identify four matters.

First, they argue that both the fourth (LBP-85-25) and third (LBP-85-14, 21 NRC 1219 (1985)) PIDs are legally flawed because they do not consider 44 C.F.R. § 350.7(b). The pertinent portion of this regulation, promulgated by the Federal Emergency Management Agency (FEMA), requires the exact size and configuration of the emergency planning zone (EPZ) around a nuclear power plant to be determined by state and local governments in consultation with FEMA and the NRC. Second, Anthony/FOE direct our attention to an appeal they now have pending before FEMA. They express confidence that FEMA will agree with their arguments and withdraw its previous approval of the entire emergency plan for Limerick, including the portion involving the Graterford facility. They contend that the withdrawal of FEMA's approval would significantly undercut the Licensing Board's fourth PID. Third, Anthony/FOE believe that they will also succeed on another appeal pending before us — that involving the Licensing Board's June 4, 1985, denial of Anthony/FOE's motion to reopen the record on a recent PECO effluent release report. Fourth, intervenors refer to three appeals they assertedly have pending before the Commission concerning a variety of topics. Again, they are confident about their likelihood of prevailing on these matters and contend that no license can issue until they are resolved.

A stay motion must also address three other factors: whether the movant will be irreparably harmed in the absence of a stay; whether the grant of a stay would harm any other party; and where the public interest lies. 10 C.F.R. § 2.788(e)(2), (3), (4). Anthony/FOE argue generally that they will be harmed by the danger of accidents, routine releases, radioactive waste, and economic losses if Limerick is licensed. They also claim that PECO's stockholders would be harmed in the short run by a stay, but would benefit eventually. Lastly, they assert that a stay would serve the public interest by avoiding rate increases that allegedly would result from the licensing of the facility.

B.

1. As a threshold argument, PECO contends that we do not have the authority even to consider Anthony/FOE's petition for stay, in light of the Commission's recent decision to make effective immediately the fourth PID and to issue the full-power license for Limerick Unit 1. Licensee's Opposition to Petition by Friends of the Earth (August 9, 1985) at 2, 5. See CLI-85-15, 22 NRC 184 (1985). PECO's argument is

without merit. The Commission's action in CLI-85-15 was explicitly pursuant to its so-called "immediate effectiveness" rule, 10 C.F.R. § 2.764(f)(2). See CLI-85-15, 22 NRC at 185. Under this regulation,

[u]nless the Commission otherwise explicitly so directs in its immediate effectiveness determination, no comment made in the course of the opinion or statement reflecting that determination is to be given any weight by the ... Appeal Board in its consideration of either a stay motion pursuant to § 2.788(e) or an appeal on the merits pursuant to §§ 2.762 and 2.785, or in any subsequent formal adjudication. The Commission's effectiveness determination is entirely without prejudice to such consideration in subsequent proceedings.

10 C.F.R. § 2.764(g). The Commission reiterates this mandate in CLI-85-15 itself, 22 NRC at 186.

The particular cases upon which PECO relies to support its view are inapposite. Indeed, several months ago in one of the proceedings cited (*Shoreham*), the Commission authorized a Licensing Board decision to become immediately effective, but nine days later the Appeal Board — reviewing an appeal from the same Licensing Board decision on the merits — reversed and vacated that decision in part, as well as the corresponding license authorization. See *Long Island Lighting Co. (Shoreham Nuclear Power Station)*, CLI-85-1, 21 NRC 275 (1985); *Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1)*, ALAB-800, 21 NRC 386, 392-98 (1985). Thus, there is no impediment to our consideration of Anthony/FOE's petition for stay.

2. None of the reasons Anthony/FOE advance in support of their stay request has merit. In the first place, arguments concerning the Licensing Board's third PID (for example, those relating to FEMA's compliance with 44 C.F.R. § 350.7(b)²) and June 4 denial of reopening on the effluent release report are far too late. Under 10 C.F.R. § 2.788(a), an application for a stay must be filed within 10 days of service of the decision for which a stay is requested. Anthony/FOE have provided no good cause for their tardiness and no compelling reason for our scrutiny of either decision in connection with this request to stay the Board's fourth PID.³

² As explained at p. 196, *infra*, the fourth PID concerns only limited emergency planning issues involving the Gratiot facility. Thus, Anthony/FOE's argument about FEMA regulation section 350.7(b) can logically be raised only in conjunction with the Licensing Board's more comprehensive offsite emergency planning decision, its third PID. And indeed, Anthony/FOE's brief on appeal from the third PID is devoted principally to this issue. See Anthony/FOE Brief (June 6, 1985), *passim*.

³ Another party, Limerick Ecology Action, did timely seek a stay of the Board's third PID, which was issued May 2, 1985. We denied this motion in ALAB-808, 21 NRC 1595 (1985).

As for the three matters Anthony/FOE claim to have pending before the Commission and on which they expect to prevail, none concerns any matter now before us on appeal. We are only generally aware of their content and cannot properly speculate as to how they might ultimately be decided.⁴ Anthony/FOE's argument that an operating license for Limerick cannot be issued until these matters are disposed of is thus more properly directed to either the Commission itself or the Director of NRR.

Anthony/FOE's remaining argument is only peripherally related to the discrete emergency planning issues addressed in the Licensing Board's fourth PID (i.e., the training for Graterford's civilian emergency evacuation personnel and the evacuation time estimate for the Graterford facility).⁵ This claim — that FEMA will withdraw its approval of the entire Limerick offsite emergency plan — is highly speculative and thus cannot serve as a basis for a stay. If FEMA were to take such action, however, this would be a significant new development that would likely warrant further action by the appropriate NRC officials at that time.

Anthony/FOE have therefore failed to make the required strong showing that they are likely to prevail on the merits of their appeal. See also note 5, *supra*. It is not enough simply to state confidence or an expectation of success before this or any other forum. *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit 1), CLI-84-17, 20 NRC 801, 804-05 (1984). Intervenor's arguments on the other three stay factors are similarly generalized and unconvincing. Especially insofar as irreparable harm — often the factor accorded the greatest weight — is concerned, a party must reasonably *demonstrate*, not merely allege, such harm. See *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-794, 20 NRC 1630, 1633-35 (1984). Anthony/FOE have failed to meet their burden of proving that a stay of the Board's fourth PID is warranted.

⁴ The Commission has referred two of these matters (concerning PECO's request for various exemptions) to NRR for initial disposition. See Order of July 24, 1985 (unpublished); Order of August 8, 1985 (unpublished). The third item, relating to Anthony/FOE's request for revocation of PECO's low-power operating license, was recently denied in a lengthy decision by the Director of NRR and is pending Commission review. See DD-85-11, 22 NRC 149 (1985).

⁵ It does not appear that Anthony/FOE were participants in this part of the proceeding. Thus, there is a question as to Anthony/FOE's right to appeal and to seek a stay of the fourth PID. We need not decide that issue now, however, but we expect all the parties concerned to address this matter in their briefs on the merits.

Anthony/FOE's motion for a stay of LBP-85-25 is *denied*.
It is so ORDERED.

FOR THE APPEAL BOARD

C. Jean Shoemaker
Secretary to the
Appeal Board

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Administrative Judges:

Gary J. Edles, Chairman
Dr. W. Reed Johnson
Christine N. Kohl

In the Matter of

Docket No. 50-289-SP
(Management Phase)

METROPOLITAN EDISON COMPANY,
et al.

(Three Mile Island Nuclear
Station, Unit No. 1)

August 29, 1985

The Appeal Board denies intervenor's motion to reopen the record for further hearing in the management phase of this restart proceeding, concluding that the motion is not timely and does not demonstrate that a different result might have been reached had the newly proffered material been considered initially.

RULES OF PRACTICE: REOPENING OF RECORD

In order to succeed, a motion to reopen a record must be timely and address a significant safety or environmental issue. It must also show that a different result might have been reached had the newly proffered material been considered initially. *Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3)*, ALAB-786, 20 NRC 1087 1089 (1984).

RULES OF PRACTICE: REOPENING OF RECORD

A year delay between the time information was made available to the parties and the time of filing a motion to reopen ordinarily renders such a motion untimely. *See, e.g., Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-775, 19 NRC 1361, 1369, *aff'd sub nom. San Luis Obispo Mothers for Peace v. NRC*, 751 F.2d 1287 (D.C. Cir. 1984), *vacated in part and reh'g en banc granted on other grounds*, 760 F.2d 1320 (1985); *Louisiana Power and Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-753, 18 NRC 1321, 1325 n.3 (1983).

RULES OF PRACTICE: REOPENING OF RECORD

In assessing the timeliness requirement of a motion to reopen the record, the question is not whether a licensing board is still receiving evidence on an issue to which the new information relates at the time the information comes to the movant's attention, but rather, whether the information could have been submitted earlier. *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit No. 1), CLI-85-8, 21 NRC 1111, 1114 & n.3 (1985); *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-138, 6 AEC 520, 523 n.12 (1973).

APPEARANCES

Louise Bradford, Harrisburg, Pennsylvania, for intervenor Three Mile Island Alert, Inc.

Deborah B. Bauser, Washington, D.C., for licensee Metropolitan Edison Company.

Lois R. Finkelstein and **Mary E. Wagner** for the Nuclear Regulatory Commission staff.

MEMORANDUM AND ORDER

We have before us a motion filed by intervenor Three Mile Island Alert, Inc. (TMIA), to reopen the record for further hearing in the

management phase of this restart proceeding.¹ The motion relies on several pieces of assertedly new information said to bear on the central issue of management competence and integrity.²

First, TMIA cites to both a draft and the final version of an August 1979 letter to the NRC from former Three Mile Island (TMI) Station Manager Gary Miller, certifying that a licensee employee, James R. Floyd (designated "VV"), had successfully completed the requalification program; the draft letter is accompanied by a memorandum from Miller asking the licensee's counsel to review the draft. TMIA also presents a copy of a November 1979 application filed by VV for renewal of his senior reactor operator's license, with an accompanying certificate of competence signed by Miller. VV's completion of the requalification program and subsequent certification to the NRC were the subject of considerable attention before the Licensing Board.³ TMIA asserts that VV's November 1979 application for license renewal and the letter and memorandum relating to the requalification were released to the parties for the first time in March of this year as attachments to an Office of Investigations (OI) report. It argues that this information shows that the licensee failed to take appropriate action insofar as VV was concerned.

Second, TMIA provides copies of an emergency procedures review examination taken by VV and another employee designated "O" in May 1979. These purportedly reveal an additional instance of cheating, not made public until June 1984, when the licensee released the tests to a grand jury. TMIA contends that the licensee's earlier "withholding" of this information is evidence of the licensee's lack of integrity.

Under the oft stated test for reopening a record, a motion

must be timely and address a significant safety or environmental issue. It must also show that a different result might have been reached had the newly proffered material been considered initially.⁴

¹ This motion was initially filed with the Commission, which has referred it to us for disposition. CL1-85-9, 21 NRC 1118, 1145 n.59 (1985), *aff'd sub nom. Three Mile Island Alert, Inc. v. NRC*, Nos. 85-2301, etc. 13d Cir. Aug. 27, 1985. See note 5, *infra*.

TMIA's submit includes two principal documents, plus appendices. The first is entitled "TMIA's Motion to Reopen the Record for the Purpose of Receiving Additional Information"; the second is entitled "TMIA's Brief in Support of its Motion to Reopen the Record for the Purpose of Receiving Additional Information." Both are dated and were served May 22, 1985, and neither is paginated. For convenience, we refer to the documents as "TMIA's Motion" and "TMIA's Brief" and supply the missing page numbers.

² For the background of the management phase of this special proceeding, see generally CL1-85-9, 21 NRC 1118, ALAB-772, 19 NRC 1193 (1984), *rev'd in part*, CL1-85-2, 21 NRC 282 (1985), LBP-82-56, 16 NRC 281 (1982), LBP-81-32, 14 NRC 381 (1981).

³ See ALAB-772, 19 NRC at 1230.

⁴ *Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3)*, ALAB-786, 20 NRC 1087, 1089 (1984).

We conclude that the motion is not timely and, in addition, does not demonstrate that a different result might have been reached had the proffered material been considered initially. That being so, we deny the request to reopen the record.⁵

A. TMIA's motion is substantially out of time. As the licensee points out, the documents (or, in one case, a handwritten version) included in the OI Report and relied upon here by TMIA were part of the so-called Speaker Report, which the licensee released to the parties over two years ago in March 1983.⁶ Indeed, drafts of the August 1979 letter to the NRC from Gary Miller and the memorandum from Miller to licensee's counsel, far from being newly revealed information, were actually introduced into evidence in November 1981 by TMIA as its Exhibit 73 and were the subject of TMIA's cross-examination during the course of the earlier proceeding.⁷ Thus, the material contained in the OI Report could easily have been submitted — and, in one instance, was actually submitted — during the course of the hearing.

With respect to the 1979 emergency procedures tests, TMIA concedes that they were made available to the parties by the licensee in June 1984, almost a year before this motion was filed.⁸ Such delay in tendering new information ordinarily renders a motion to reopen untimely.⁹ TMIA attempts to justify its tardiness in submitting this information by noting simply that the Licensing Board was no longer receiving evidence

⁵ As noted above, the motion rests in part on information surrounding Miller's August 1979 letter to the Commission regarding VV's completion of the requalification program. In examining this matter initially, the Licensing Board concluded that Miller — and, hence, the licensee — had made a material false statement to the Commission. It conditioned any restart on a requirement that Miller's participation in the licensee's operations be under the direct supervision of an "appropriately qualified" licensee official. It also recommended that the Commission institute a broader investigation into the matter. See LBP-82-36, 16 NRC at 292-93, 344-55. The Commission fairly promptly agreed with the Board's recommendation and turned the matter over to OI. At the same time it directed us not to consider this matter as part of our then-forthcoming appellate review of the Board's decisions. CLI-82-31, 16 NRC 1236, 1237, 1239-40 (1982). In compliance with the Commission's directive, we thus did not scrutinize the certification incident. In response to TMIA's general arguments about the licensee's management capability, however, we acknowledged that the episode was additional evidence that serious management problems had existed throughout the licensee's training organization. ALAB-772, 19 NRC at 1230-31.

⁶ Licensee's Answer to TMIA's Motion to Reopen the Record for the Purpose of Receiving Additional Information (May 29, 1983) (hereafter, "Licensee's Answer") at 7 n.7. See letter to Appeal Board from Ernest L. Blake, Jr. (March 14, 1983) and Enclosure (hereafter, "Speaker Report"). The Speaker Report was prepared by Fred Speaker, an attorney with the Harrisburg, Pennsylvania office of the law firm of Pepper, Hamilton & Scheetz. He conducted a review of the August 1979 certification of VV at the request of the licensee. See also Board Notification No. BN-83-28 (March 4, 1983).

⁷ See Tr. 24,412-15.

⁸ TMIA's Motion at 2. See Notice to the Commission, Appeal Board, Licensing Board and Parties (June 1, 1984) and Supplement to June 1, 1984 Notice to the Commission, Appeal Board, Licensing Board and Parties (June 5, 1984).

⁹ See, e.g., *Pacific Gas and Electric Co. (Disho Canyon Nuclear Power Plant, Units 1 and 2)*, ALAB-773, 19 NRC 1361, 1369, *aff'd sub nom. San Luis Obispo Mothers for Peace v. NRC*, 751 F.2d 1287 (D.C. Cir. 1984), *vacated in part and reh'g en banc granted on other grounds*, 760 F.2d 1320 (1985); *Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3)*, ALAB-753, 18 NRC 1321 1325 n.3 (1983).

on cheating at the time TMIA obtained the information.¹⁰ But TMIA misconceives the timeliness requirement. The question is not whether a board is still receiving evidence on an issue to which the new information relates at the time the information comes to the movant's attention. (Indeed, motions to reopen the record will invariably involve the proffer of information that would have been considered at an earlier stage of a proceeding.) The critical question is whether the information could have been submitted earlier.¹¹ In this case the answer is yes. TMIA's justification for having failed to tender the O and VV emergency procedures tests for almost a year is thus insufficient.¹²

B. The Licensing Board and the Special Master reviewed scores of allegations as part of a wide-ranging examination of management competence and integrity. Among the matters expressly considered during the course of the proceeding were Miller's August 1979 certification of VV's successful completion of the requalification program;¹³ cheating on licensee-administered examinations, including the collaboration of O and VV (although not their collaboration on the particular examination attached to TMIA's motion);¹⁴ and management's response to the cheating incidents, including its response to VV's cheating.¹⁵ We are fully satisfied that the information tendered by TMIA, even if timely presented, would not have produced a different result in the Board's resolution of these matters.

1. TMIA asserts that, despite its earlier request for all documents related to cheating, the licensee withheld the 1979 emergency procedures review examinations until forced to release them to a grand jury.¹⁶ It argues that the tests were graded in 1979, so the training department

¹⁰ TMIA's Motion at 2. TMIA also states that OI was investigating a later cheating incident involving O and VV. The relevance of that fact to TMIA's delay in submitting the instant information is not apparent.

¹¹ *Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1)*, CL1-85-8, 21 NRC 1111, 1114 & n.3 (1985); *Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station)*, ALAB-138, 6 AEC 520, 523 n.12 (1973).

¹² We note, in addition, that in June 1984 and again in September 1984, as part of its deliberations looking toward a final restart decision, the Commission explicitly invited the parties to bring to its attention any unresolved matters that needed to be explored before a final decision could be made. See CL1-84-18, 20 NRC 808 (1984); Order of June 1, 1984 (unpublished) at 2. TMIA submitted comments in response to both of the Commission's orders but did not refer to the matters now included in its motion. TMIA Response to June 1 Order (July 26, 1984); TMIA Response to Commission Order of September 11, 1984 (October 9, 1984). Given the Commission's express solicitation of views as to what matters remained for resolution, TMIA had a heightened obligation to canvass its files and present any new matters that might bear on the restart question.

¹³ LBP-82-56, 16 NRC at 292-93, 348-55.

¹⁴ *Id.* at 325; LBP-82-34B, 15 NRC 918, 969, 1006-13 (1982).

¹⁵ LBP-82-56, 16 NRC at 293-95, 344-48.

¹⁶ TMIA's Motion at 1-2.

must have known about this additional incident of cheating.¹⁷ The licensee indicates, however, that the tests were not reviewed earlier because of an agreement with TMIA not to provide exams prior to 1980 unless they involved a known incident of misconduct. It maintains that the tests here at issue were discovered only when it began a document review in connection with the later grand jury investigation of VV.¹⁸

This added illustration of cheating by O and VV on a licensee-administered test would not have affected any pertinent Licensing Board conclusion on the cheating itself. In reaching its determination regarding management integrity, the Board explicitly declined to conclude that all possible cheating had been revealed.¹⁹ It was fully aware, moreover, that the licensee's training department was not entirely an innocent bystander; that department, after all, had assigned VV a passing score on a portion of his requalification exam although Supervisor of Training Richard Zechman was aware that O had contributed to VV's exam and had discussed the matter with Miller.²⁰ What was clear — and what was decisionally significant — was that the administration of the licensee's testing program was quite lax.²¹ Any further evidence of cheating, including the training department's possible knowledge and concealment of such cheating, would not have materially altered that conclusion.²²

Insofar as TMIA contends that the licensee improperly withheld this information and did not fully respond to its discovery request, we cannot definitively determine why the additional incident of cheating by O and VV was not brought to public attention earlier. The discovery papers and licensee's argument here are ambiguous.²³ Other factors, however, lead us to conclude that the licensee's failure to produce the tests earlier was likely inadvertent and, in any event, would not have altered any previous Board findings.

For one thing, as the Licensing Board emphasized, the involvement of O and VV in cheating was first brought to the Commission's attention by Robert Arnold, licensee's former president.²⁴ In due course, O's employment was terminated due to other cheating, and VV resigned.²⁵

¹⁷ TMIA's Brief at 4.

¹⁸ Licensee's Answer at 3 n.3.

¹⁹ LBP-82-56, 16 NRC at 290.

²⁰ *Id.* at 349-50.

²¹ *Id.* at 337. See also ALAB-772, 19 NRC at 1212 n.15, 1231-32.

²² See ALAB-774, 19 NRC 1350, 1356 (1984).

²³ See TMIA's First Set of Discovery Requests of Licensee in Reopened Hearing of Cheating Incident (As Modified by Agreement) (October 2, 1981); TMIA's First Set of Interrogatories Addressed to Licensee (October 8, 1981) at 8; Licensee's Answer at 3 n.3.

²⁴ LBP-82-56, 16 NRC at 293, 335.

²⁵ ALAB-772, 19 NRC at 1231 n.45.

There appears to be no incentive, therefore, for licensee to have concealed an additional incident of cheating by these individuals. Further, TMIA has provided no basis on which we could conclude that licensee routinely and intentionally withheld discoverable material pertinent to the hearing. Nor has TMIA given us cause to reconsider our own earlier conclusion that licensee's investigation of various cheating incidents was adequate.²⁶ Finally, the principal managers that might have been involved in any deliberate effort to conceal are no longer licensee officials. The significance of the additional incident of cheating by O and VV to the outcome of this proceeding is thus de minimis.

2. TMIA continues to challenge the propriety of the sanctions imposed against VV by the licensee's top management. The Special Master did not believe that VV's reassignment to the Accident Investigation Documentation Group following discovery of his cheating was a demotion or sufficiently punitive to serve as a deterrent. As a consequence, he believed that the licensee had failed to declare a clear policy against what VV did.²⁷ The Licensing Board took a somewhat different view. It was less critical of the licensee's motives, believing that VV's peers most likely viewed the reassignment as a demotion. The Board concluded that Arnold's reassignment of VV was a proper reallocation of the company's personnel resources.²⁸

TMIA now submits a copy of VV's senior operator license renewal application, which was filed after he had been reassigned but nevertheless lists him as Supervisor of Station Operations. TMIA also points to the certificate of competence, which was signed by Miller in connection with the application but does not indicate VV's reassignment.²⁹ TMIA concludes that this represents further evidence that the Special Master was right and the Licensing Board was wrong.³⁰

We cannot conclude that this information would have affected the Board's determination regarding the adequacy of management's response to VV's cheating. The Board fully evaluated the circumstances surrounding VV's reassignment.³¹ It was aware that neither Miller nor VV ap-

²⁶ See *id.* at 1229-30.

²⁷ LBP-82-34B, 15 NRC at 1009-13.

²⁸ LBP-82-56, 16 NRC at 347-48.

²⁹ TMIA's Motion at 4. The certificate of competence stated that VV had "discharged his license responsibilities in a competent and safe manner during his current license period." *Id.*, Exh. C (OI Report), Attachment 27.

³⁰ TMIA's Brief at 2.

³¹ LBP-82-56, 16 NRC at 345-48.

peared to view the cheating incident as particularly troubling.³² TMIA's "new" information would, at most, supply additional confirmation of this. For the purpose of evaluating management integrity, however, the Board focused its attention on Arnold's response.³³ It found that response appropriate, noting as well that VV's Unit 1 license had been voided and that the licensee did not plan to recertify VV for Unit 2 licensing.³⁴ Nothing in TMIA's presentation here undermines that ultimate Board assessment so as to warrant reopening.

TMIA's motion to reopen the record for further hearing is *denied*.
It is so ORDERED.

FOR THE APPEAL BOARD

C. Jean Shoemaker
Secretary to the
Appeal Board

³² *Id.* at 345-46. It is not clear why the license renewal application referred to VV as Supervisor of Station Operations. In answer to questions from Speaker during his investigation of the incident, Miller suggested that the application and accompanying certificate were probably prepared by the training department, which simply relied on an outdated computer printout of names and titles. The language of the certificate of competence was said to be a standard format used by the training department. Speaker Report, Investigation of VV's Qualifications 1979-1982, Deposition of Gary Miller (December 17, 1982) at 18-21.

³³ LBP-82-56, 16 NRC at 346-48.

³⁴ *Id.* at 348, 355.

Atomic Safety and Licensing Boards Issuances

ATOMIC SAFETY AND LICENSING BOARD PANEL

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LICENSING BOARDS

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

James L. Kelley, Chairman
Dr. James H. Carpenter
Glenn O. Bright

In the Matter of

Docket No. 50-400-OL
(ASLBP No. 82-472-03-OL)

CAROLINA POWER & LIGHT
COMPANY and
NORTH CAROLINA EASTERN
MUNICIPAL POWER AGENCY
(Shearon Harris Nuclear Power
Plant)

August 14, 1985

This Memorandum supplies the reasons supporting the Licensing Board's earlier grant of several motions for summary disposition on emergency planning contentions.

REASONS SUPPORTING SUMMARY
DISPOSITION OF EMERGENCY PLANNING
CONTENTIONS

In memoranda and orders dated February 27, 1985, and April 24, 1985 (both unpublished), we ruled on several motions from the Applicants for summary disposition on emergency planning contentions. In those orders, we provided explanations of our rulings only when we denied a motion. We hoped thereby to help the parties plan for litigation

and to speed the start of that litigation. In both orders we said we would provide explanations of the other rulings at a later date. We now provide explanations for our rulings in every instance in which we granted a motion that was opposed by one or more intervenor, and we impose one condition on the issuance of a full-power license. See our discussion of Contention 213a, *infra*. About half the motions for summary disposition were unopposed. We are mindful that the failure of the party opposing summary disposition to submit evidence against the disposition does not require that the motion be granted. The movant must still meet his burden of proof to establish the absence of any genuine issue of material fact. *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 753-54 (1977). We have judged that in every instance in which the motion was unopposed, the Applicants did indeed meet their burden of proof, but in light of the lack of opposition, we have not thought it necessary or useful to repeat arguments of the parties who supported the motion.

By and large, licensing boards, when considering motions for summary disposition under 10 C.F.R. § 2.749, will apply the standards established by the courts for considering motions for summary judgment under Rule 56 of the Federal Rules of Civil Procedure. *Alabama Power Co.* (Joseph M. Farley Nuclear Plant, Units 1 and 2), ALAB-182, 7 AEC 210, 217 (1974). A motion for summary disposition will be granted when the record shows that there is no genuine issue as to any material fact, and that the moving party is entitled to a favorable decision as a matter of law. 10 C.F.R. § 2.749(d). The record must be viewed in the light most favorable to the party opposing the motion. See *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), LBP-74-36, 7 AEC 877, 897 (1974) (citing federal court cases).

ONSITE EMERGENCY PLANNING

We admitted two contentions on onsite emergency planning, Contentions 144 and 154, in our Memorandum and Order, November 1, 1983, at 11-12, 5, respectively. The Applicants filed a motion for summary disposition of the contentions on October 8, 1984. Accompanying the motion was an affidavit from Robert G. Black, Jr., Director of Emergency Preparedness for the Applicant. The Staff replied on November 8, 1984, in support of the motion. Accompanying the Staff's reply was an affidavit from Gerald E. Simonds of the Office of Inspection and Enforcement, Division of Emergency Preparedness and Engineering Response, Emergency Preparedness Branch, in the NRC. Mr. Simonds is a technical reviewer of work at the Shearon Harris plant and is responsible

for assessing onsite emergency plans and preparedness. The Intervenor, Mr. Wells Eddleman, replied in opposition to the motion on November 19, 1984. We granted the motion in our Memorandum and Order, February 27, 1985, at 1.

Contention 144

The text of Contention 144 is as follows:

CP&L's emergency personnel levels do not meet the requirements of NUREG-0737, REV 1 [sic; Supp. 1] Table 2.

The Table sets out what the Staff thinks to be the minimum staffing a licensee should have during an emergency at a nuclear power plant. One issue raised by the contention in its original form, when the Applicants were still planning to complete a second unit, was whether the staffing levels would be sufficient to deal with a damaged reactor and an undamaged one at the same time. See "Wells Eddleman's Motion Concerning DCRDR Information," January 8, 1983. This issue has since been mooted by the Applicants' decision to cancel plans for the construction of a second unit.

The Commission's emergency planning regulations require, among other things, that

adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, [and that] timely augmentation of response capabilities is available . . .

10 C.F.R. § 50.47(b)(2). This standard is elaborated by evaluation criteria in NUREG-0654, which sets out guidelines for assembling and reviewing emergency plans for nuclear power plants. Evaluation Criterion B.5 provides, in relevant part:

Each licensee shall specify the positions or title and major tasks to be performed by the persons to be assigned to the functional areas of emergency activity. For emergency situations, specific assignments shall be made for all shifts and for plant staff members, both onsite and away from the site. These assignments shall cover the emergency functions in Table B-1 entitled, "Minimum Staffing Requirements for Nuclear Power Plant Emergencies." The minimum on-shift staffing levels shall be as indicated in Table B-1. The licensee must be able to augment on-shift capabilities within a short period after declaration of an emergency. This capability shall be as indicated in Table B-1. . . .

Table B-1, to which this evaluation criterion refers, is the same as the table referred to in the contention, Table 2 of NUREG-0737. Compliance with Evaluation Criterion B.5, or any other evaluation criterion in NUREG-0654, is not necessarily required by the Commission's emergency planning regulations. *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit No. 1), ALAB-698, 16 NRC 1290, 1299 (1982), *rev'd in part on other grounds*, CLI-83-22, 18 NRC 299 (1983). Like the Commission's Regulatory Guides, NUREG-0654 has never been the subject of rulemaking. Methods and solutions different from those set out in the guides are acceptable if they provide a basis for findings which must be made before a license or permit can be issued or continued. ALAB-698, *supra*, 8 NRC at 1298-99.

The numbers in Tables 2.2-1 and 2.2-2 in the emergency plans for Shearon Harris represent the staffing levels the Applicants would adhere to in an emergency. It is no longer in dispute in this proceeding that, during an emergency, the Applicants would have an adequate number of people with the skills needed to meet the emergency.

The Intervenor argues, however, that the current plans do not make several of the people available soon enough. Intervenor's Reply at 1-3. The two just-mentioned tables in the plans reveal that the Applicants would have certain emergency stations manned within 30 to 45 minutes of the start of an emergency, and certain other stations within 60 to 75 minutes. However, the analogous table referred to by Evaluation Criterion B.5, Table B-1 at 37-38 in NUREG-0654, would have the same stations manned within exactly 30 and 60 minutes, respectively. The Intervenor argues that since a footnote to the emergency planning regulations in 10 C.F.R. § 50.47(b) says that the planning regulations are "addressed" by the evaluation criteria in NUREG-0654, the criteria have the legal force of regulations. Intervenor's Reply at 1.

As we have shown above, Commission case law is to the contrary: The Staff will accept, and claims to have accepted in this case, reasonable deviations from the evaluation criteria. Staff Reply at 6-8. It is arguable that it remains then to be determined by us whether in this case the Staff and the Applicants are being reasonable. The Applicants cite possible adverse weather as a reason for extending by at most 15 minutes the time within which certain stations would be manned in an emergency. Motion at 6. The Intervenor in effect argues that such weather would be good reason to man those stations 15 minutes earlier. These trivial differences do not rise to the level of a disputed material fact. By way of contrast, the two cases we cited earlier involved one time limit embodied in Table B-1 in NUREG-0654 and at issue here. The Table calls for one of a licensee's senior managers to be in command of a licensee's

Emergency Operations Facility within one hour, but the licensee in that case proposed *four* hours. See CLI-83-22, *supra*. We find that the Applicants' proposed response times satisfy 10 C.F.R. § 50.47(b)(2).

Contention 154

The text of the contention is as follows:

Plant operators are assigned to make the dose assessments (see Table 2.2.3, page 2) [in the Site Emergency Plan (SEP) Rev. 2]. These personnel are unqualified to make the detailed judgments that may be required by the procedures for dose estimating, given in Annex B of the SEP.

In an emergency, projections of offsite dose would be crucial determinants of what protective actions were taken. According to Annex B, plant operators would perform dose assessments until the health physics staff had arrived. The Intervenor, Mr. Eddleman, asserts that

[t]he complexity of judgment required in Annex B is beyond the training, as far as the SEP establishes, of ordinary reactor operators. Moreover, there are no educational or other requirements for operators that assure they will exercise good judgment in dealing with this complex task under the pressure of accident conditions

The Applicants' main argument is that, in an emergency, operators would follow not Annex B but the Plant Emergency Procedures (PEPs) contained in the Plant Operating Manual, Vol. 2, Bk. 5, that Annex B contains the technical background and justification for those procedures, but not the procedures themselves. Motion at 7. The Applicants also argue that since the contention is directed to Annex B under the misimpression that the contents of Annex B were to be construed as procedures, the Applicants have, strictly speaking, met their burden on summary disposition simply by pointing out that Annex B contains no procedures.

Nonetheless, the Applicants willingly assume, for the sake of argument, that the contention is directed to the procedures, and go on to argue that, between flow charts and "cookbook" descriptions of calculations, the procedures leave little room for judgment (Black Affidavit, ¶¶ 5-10), and that, in accordance with the Commission's regulations and guidance on emergency planning, there are training programs, drills, and federally evaluated, full-scale exercises planned which will prepare the plant operators sufficiently to perform dose assessment under emergency conditions. Black Affidavit, ¶¶ 12-17. The Applicants report that the Staff has approved their training program. *Id.* ¶ 17.

The Intervenor replies principally that the Applicants nowhere in their motion argue that the operators are *now* — on the date the Intervenor filed his reply — trained to perform dose assessments (Intervenor's Reply at 3-4), and secondarily, that the PEPs, though they may be simpler than Annex B, still leave too much room for judgment. The Intervenor cites as examples several details in one PEP. *See id.*, "List of Facts in Dispute — Contention 154."

Both of the Intervenor's arguments clearly amount to new contentions. The argument concerning the PEPs is new because the text of the contention is directed quite concretely to the form and substance of Annex B. *That* text, the contention says, is beyond the operators' competence.¹

The Intervenor's principal argument is ambiguous, but, no matter which way it is read, it also is new. At first glance it appears to mean merely that operators should have been competent in dose assessment before the Applicants moved for summary disposition. The text of the contention, though, is about the complexity of Annex B, not the state of preparedness of the operators during litigation of the contention. Moreover, there is no reason in law, or from good sense, for someone to be competent in dose assessment before that person needs to be, namely before the various scheduled tests of that competence.

By the argument that the motion must fail because the operators are not now trained, the Intervenor may intend something not apparent on the face of the argument, namely, that only health physics staff persons should do dose assessment, for only they would have had the longstanding, professional, specialized training which would enable them to perform dose assessments reliably in times of stress. This claim is far broader than the claim in the contention, which was simply that operators could not be expected to perform what appeared to be procedures in Annex B, not that the operators could not reliably perform for a short,² though stressful, time any conceivably adequate set of dose assessment procedures, no matter what the operators' training.

¹ Given the bar in *Louisiana Power and Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1107 (1983) against litigating the myriad, often-changing, details of implementing procedures, a contention on the PEPs might not have been admissible.

² Table B-1 at 37 in NUREG-0654, which, as we reported in our discussion of Contention 144, Mr. Eddleman would have us treat as law, calls for senior health physics expertise to be available within 30 minutes of the start of an accident.

OFFSITE EMERGENCY PLANNING

Eddleman Contentions 215(1) and 215(3)

The texts of the contentions are as follows:

In violation of 10 C.F.R. 50.47(b)(10) CP&L's evacuation time study does not conform to NUREG-0654 Appendix 4 and will not provide accurate and useful guidelines for the choice of protective actions during an emergency because the study contains numerous so-called "conservatisms" including those referring to recreational populations and vehicle capacity factors (see e.g. sections 3-3 and 3-6) which may force evacuation time estimates upwards and provide inaccurate estimates for decisionmakers during an emergency, in the opinion of expert Paul Holmbeck. Potential hazards of such "conservatisms" are discussed in the 1984 *Byron* partial initial decision under emergency planning.

1. The assumption of evacuation from home. For certain times of day, this assumption is unrealistic for many persons who will not be at home, but be at work, school, shopping, doctor's office, etc. This could also result in double counting of evacuees for persons who both live and work within the EPZ (6/14/84 Order at 31).
3. The apparent assumption that those households without vehicles will automatically evacuate with neighbors (or can) at the rate of one vehicle per household.

We admitted Contention 215 in our "Further Rulings on Admissibility of Offsite Emergency Planning Contentions . . .," June 14, 1984 (unpublished), at 24. However, we ordered that before the contention could be litigated, Mr. Eddleman would have to make it more specific. He did so on June 29, 1984, and we ruled on the specified contention, and the replies to it, on October 4, 1984, admitting parts (1) and (3) of the specified contention.

The Applicants filed for summary disposition of Contention 215(1) on January 7, 1985, and for summary disposition of Contention 215(3) on January 14, 1985. Accompanying each motion was an affidavit from Robert D. Klimm and one from Dr. Dennis S. Mileti.³ Mr. Klimm is an Associate of HMM Associates, Inc., which has been under contract to the Applicants to perform the evacuation time study. Mr. Klimm's work includes management and supervision of such studies, and he was the Principal Transportation Engineer of the study for the Shearon Harris facility. He was also involved in the system development of the NETVAC computer model, which has been used in evacuation time studies at several nuclear power plants. Dr. Mileti is Associate Professor

³ Dr. Mileti's affidavit on Contention 215(1) was filed on January 10, 1985.

in the Department of Sociology at Colorado State University and Director of the Hazards Assessment Laboratory at the University.

The Staff replied in support of the motions on February 6, 1985 (on Contention 215(1)) and February 27, 1985 (on Contention 215(3)). Accompanying each of the Staff's replies was an affidavit from Dr. Thomas Urbanik II, Associate Research Engineer and Program Manager at the Texas Transportation Institute, part of the Texas A&M University System. Dr. Urbanik is also Lecturer in the Civil Engineering Department at the University. He subcontracts to Battelle Pacific Northwest Laboratories to assist them in their review for the NRC of evacuation time estimates for nuclear power plants. He was principal author of NUREG/CR-1745, "Analysis of Techniques for Estimating Evacuation Times for Emergency Planning Zones," November 1980, and he has reviewed the initial evacuation time estimates for over fifty nuclear power plants. The results of his reviews appear in NUREG/CR-1856, "Analysis of Evacuation Time Estimates Around 52 Nuclear Power Plant Sites," May 1981.

The Intervenor, Mr. Wells Eddleman, replied in opposition to the Applicants' motions for summary disposition on February 15, 1985 (on Contention 215(1)) and on March 11, 1985 (on Contention 215(3)).

Contention 215(1)

The Commission's regulations require applicants to make, and keep current, evacuation time estimates for use in an emergency, and NUREG-0654 contains quite detailed guidance for constructing such estimates. Part 50, Appendix E, § IV, the introductory paragraph, of 10 C.F.R., says, among other things, that "[t]he nuclear power reactor operating license applicant shall also provide an analysis of the time required to evacuate and for taking other protective actions for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations." The requirement for such estimates stems ultimately from 10 C.F.R. § 50.47(b)(10), which says, in relevant part, that "[g]uidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place" Evacuation time estimates are such guidelines, since, in a particular emergency, they would help determine whether evacuation were a practical alternative to sheltering. The Federal guidance mentioned by the just-quoted regulation appears in NUREG-0654. There, the evaluation criteria which address the regulation say that the estimates shall be in accordance with Appendix 4 of NUREG-0654. See Evaluation Criteria J.8 and J.10.1. Though, as we have held elsewhere in this Deci-

sion, NUREG-0654 generally does not have the legal force of regulations, the language of § 50.47(b)(10) that the guidelines shall be "consistent with Federal guidance," gives special force to the guidance on evacuation time estimates. No party to the litigation of these two contentions disputes that Appendix 4 to NUREG-0654 should govern our ruling on these two contentions. Indeed, both Intervenor and Applicants appeal to the guidance.

These evacuation time estimates are to be as realistic as is reasonably achievable. Although generally, when making estimates having to do with nuclear safety, it is prudent to incorporate conservatism wherever the calculations are uncertain, it would be imprudent to be unnecessarily conservative in making an estimate of evacuation time, for an overestimate of sufficient magnitude could, in an emergency, lead those who must choose protective actions to avoid evacuation because they thought it would take too long when, in fact, it would have resulted in less exposure to radiation than sheltering would have. See *Commonwealth Edison Co.* (Byron Nuclear Power Station, Units 1 and 2), LBP-84-2, 19 NRC 36, 262-63 (1984).

The Applicants' motion for summary disposition of Contention 215(1) stresses what they claim to be the reasonableness and realism of the disputed assumption in the time estimates that every resident of the plume EPZ would evacuate from home. The Applicants' affiants report that experience with emergency evacuations and the literature on such evacuations support the assumption that residents of the plume EPZ will return home before evacuating. Klimm Affidavit, ¶ 6; Mileti Affidavit, ¶¶ 4, 7. Residents would return home principally, according to the affiants, to form families and other groups for mutual aid and protection. *Id.* The time estimates allot up to 2 hours for "preparation" for evacuation, and this figure, based on discussions with local officials, allows for returns home. Klimm Affidavit, ¶ 7. More than twenty evacuation time estimates use this assumption; most of these have been approved by the Staff, and the rest are under review. *Id.* ¶ 4. Indeed, the Applicants point out, the guidance in Appendix 4 of NUREG-0654 requires that the populations at recreational facilities, industrial facilities, and the like, be treated as separate from the permanent population of the EPZ. Klimm Affidavit, ¶ 5. See NUREG-0654, Appendix 4, at 4-2 to 4-3.

The Applicants argue that to the extent the assumption leads to double-counting at all, it makes the estimates not conservative but more realistic. Although many children who attend school in the EPZ also live there, their evacuating from school instead of from home would have an effect not on the number of cars used by those who evacuate from home, but only on the number of passengers in the cars, for parents, at

least, would still be leaving from home, and — goes the assumption which is the subject of Contention 215(3) — would still be using one car. Klimm Affidavit, ¶ 9. Thus the double-counting of some schoolchildren does not entail a double-counting of cars, and since it is the count of cars which is a crucial factor in time estimates, the double-counting of schoolchildren cannot lead to an overestimation of evacuation time.

Some double-counting of cars does occur in the time estimates in relation to permanent residents who also work within the EPZ or who would be in one of the recreation areas in the EPZ at the time of the accident. The estimates do count the cars of such residents twice, once as leaving from the place of employment or recreation, and once as leaving from home. However, although the cars are counted twice, the departures are not. Under the assumption that permanent residents, except for the schoolchildren among them, will evacuate from home, residents who before evacuating return home from employment, recreation, shopping, and the like, would be leaving both home and those places. *Id.* The assumption thus leads, the Applicants argue, to greater accuracy because it simulates, to a degree, the traffic "friction" (as the Applicants call it) caused by these departures toward home. *Id.*

The Staff agrees that the assumption of return home is supported by experience and the relevant literature, that Appendix 4 of NUREG-0654 says that the estimates are to treat residential populations separately from factory populations and the like, and that double-counting schoolchildren who live in the plume EPZ cannot lead to an overestimation of the number of cars that would be on the road. However, as to permanent residents who work in the EPZ or are otherwise away from home at the time of an accident, the Staff does not claim, or argue against the claim, that such double-counting simulates traffic "friction." The Staff is content to say that no data exist which would enable the estimates to avoid such double-counting. Urbanik Affidavit at 2.

As happens too often with Intervenor Eddleman's replies to motions for summary disposition, his reply to this motion appears to be in fact a new contention, at least to the extent we are able to construe its aim. He no longer charges that there is anything unreasonable or conservative about the assumption of evacuation from home.⁴ Rather he tries to raise

⁴ It was unusual to have an intervenor arguing against such an assumption, since it is very like the claim so often advanced by intervenors in these proceedings, and advanced in Contention 4(d) in this proceeding, that parents with children in school would pick them up before evacuating. Intervenor's don't often claim that evacuation times have been overestimated either. In fact it was also odd to have Applicants arguing such an assumption, since they usually claim that parents would not try to pick up their schoolchildren before evacuating. The Applicants here avoid contradicting this usual claim by saying that families would unite — unless they received sound public information to the contrary. See Milet Affidavit, ¶ 7, see also our discussion of Contention 4(d).

new issues about the accuracy of the time estimates' "simulation" of the traffic "friction" caused by return home before evacuation. He claims that neither the estimates' double-counting nor the 2-hour preparation time they allot can accurately represent the traffic home before evacuation: The double-counting assumes that all cars counted would be leaving the plume EPZ, but at least some of the traffic home before evacuation would be against the flow of the traffic leaving the EPZ; and the number of hours allotted for preparation is apparently only based on undocumented discussions with local officials, not on the traffic densities caused by trips home. Eddleman Reply at 1-2.

The closest the Intervenor comes to maintaining the charge that double-counting leads to an overestimation of evacuation times is to assert that since the Staff claims that no data exist which could be used to avoid this double-counting, there is no way of telling how large it may be. However, this assertion fails to raise a litigable issue because it, as the rest of the reply, concerns the accuracy of the estimates' ways of accounting for traffic home, not any conservatism caused by an allegedly unreasonable assumption.

Moreover, even if the assertion that the double-counting may be quite large is construed as a claim that the double-counting leads to an overly conservative estimate, the assertion still fails to raise a genuine issue about a material fact, for the absolute size of the double-counting is irrelevant. Rather, what matters is the size of such double-counting relative to the traffic "friction" the Applicants claim to be simulating, and it might be expected that the larger the number of cars double-counted, the greater the "friction" to be simulated, since a larger number of permanent residents would be going home before evacuating.

Of course, as we have noted above, the failure of an opponent of a motion for summary disposition to show that there is a genuine issue of material fact does not, especially in proceedings involving health and safety questions, relieve the proponent of the motion of the burden to show that there is no such issue. However, we believe that the Applicants have carried that burden here. The reasonableness of the assumption that permanent residents will evacuate from home is no longer at issue among the parties, and we see no reason that it should be. Moreover, the Applicants are, in this case, entitled to a favorable decision as a matter of law, for even if the assumption of evacuation from home results in some overestimation of the evacuation time,⁵ the conservatism is hardly out of line with the law on this subject, Appendix 4 of

⁵ Arguably a possibility when some accommodation to those trips home is already made by the 2-hour allotment for preparation time.

NUREG-0654, which, though it cautions against overcounting (see Appendix 4 at 4-2), clearly permits a considerable overestimation of the total evacuation time by permitting the assumption that each stage of the evacuation is wholly complete before the next stage begins, for instance, that no one begins to evacuate until everyone is prepared to do so. The authors of Appendix 4 acknowledge that this assumption, which was not used in the SHNPP time estimates, "tends to overestimate the evacuation time." *Id.* at 4-7. There is no indication that the double-counting in the SHNPP time estimates, which, as we have argued above, is a double-counting of cars, but not of departures, would lead to as high a degree of overestimation as the assumption that each stage of the evacuation is complete before the next one begins.⁶

Contention 215(3)

Appendix 4 of NUREG-0654 says that the time estimates, in determining how long it might take the permanent residents of the plume EPZ to evacuate, should divide the class of households of permanent residents into two subclasses, one consisting of households with automobiles, and the other consisting of those without. The Appendix stresses that special attention must be given to those households not having automobiles. See NUREG-0654, Appendix 4 at 4-2 to 4-3, 4-9. The time estimates assume that the some 600 households without automobiles will evacuate at the rate of one vehicle per household, the same rate at which households with automobiles are assumed by the estimates to evacuate.

The Applicants argue that this assumption is not a conservatism at all, but rather a practical means of simulating the traffic which would be generated by the friends, neighbors, or emergency workers who would provide transportation to those without automobiles. Applicants' Motion at 9; Miletic Affidavit, ¶ 2. Again as with the double-counting considered in Contention 215(1), cars might be double-counted, but departures might not be. The Applicants report that the assumption was

⁶ Moreover, it appears that the law could not be otherwise on this issue, for the reason the Staff gives, that there are no data with which to avoid the double-counting here (Urbanik Affidavit, ¶ 5), by which, we take it, the Staff means not merely that the authors of the estimates have not gathered the data, but that they cannot be gathered. In theory it might be possible first to determine for every industry and office in the plume EPZ which employees live in the plume EPZ (Indeed, NUREG-0654, at 4-2 to 4-3, says to so determine, using employment data.) and how far they would have to go to get home, and then model both this preevacuation evacuation of residents and its interaction with the evacuation of nonresidents and residents at home at the start of an accident. But, clearly, no comparable method is possible, even in theory, for recreational areas, shopping centers, and the like, for the modeler cannot know which patrons of these places at the time of an accident lived in the plume EPZ and how far they were from their homes. This same argument of the Staff's also runs against the Intervenor's call for greater accuracy in the simulation of the "friction" generated by trips home before evacuation.

reviewed with local emergency preparedness officials and "was determined" to be the most realistic means of simulating the traffic generated by people going to households which have no automobiles. Klimm Affidavit, ¶ 7. The Applicants also report that HMM Associates has used this assumption in the many estimates it has done for other nuclear power plants, and that the NRC Staff has thus far always accepted the assumption. *Id.* ¶¶ 3, 10. Affiant Klimm estimates that even if it were assumed that *no* vehicles were used in evacuating households which have no automobiles, there would be only at most 655 fewer automobiles evacuating and the evacuation time estimates would be reduced by no more than 10 minutes. *Id.* ¶ 9.

The Staff argues that the assumption at issue here is not the most realistic that could be made, since it amounts to an assumption that for each household without an automobile, one car will travel some distance to evacuate that household, that, in effect, each such household will be evacuated by taxi. However, the emergency plans contemplate more efficient means of providing transportation for these households. Urbanik Affidavit at 3. In any event, the Staff's affiant Dr. Urbanik concludes that any more realistic assumption would reduce the estimates by only 5 to 10 minutes, and that the present overestimation in the time estimates would not lessen the usefulness of the estimates in an emergency. *Id.*

In reply, the Intervenor, Mr. Wells Eddleman, attacks both the logic of the assumption and the Staff's conclusion that whatever overestimation the assumption entails is not significant and would not lessen the usefulness of the estimates. In regard to logic, the Intervenor argues that the assumption is not consistent with affiant Milet's claim that transportation for some of these households would be provided by neighbors, for, in this case, there is no extra traffic to be simulated. In regard to the significance of any overestimation the assumption may entail, the Intervenor argues that the Staff has not proved that the overestimation is not significant, or that it would not lessen the usefulness of the estimates in an emergency.

As with Contention 144, the Intervenor would have us go to hearing over a matter of a few minutes. He does not dispute that the minutes involved are no more than 10, yet he appears to think that the level of precision in evacuation time estimates is such that 10 minutes could be significant. Moreover, as with Contention 215(1), there may not be the data which would permit a less conservative assumption, for although a survey has been conducted which gave households without automobiles an opportunity to make their emergency transportation needs known, there is no sure way of knowing in advance of an emergency how many

of those households would evacuate with nearby persons such as neighbors and how many might require help from further away. Perhaps a range of possibilities might be set out, and some probabilities assigned within that range, but any possible gain in accuracy does not require an evidentiary hearing.

Contention 213a

The text is as follows:

Either each off-site ERP should contain an appendix which conforms to evaluation criterion IL.P.7 of NUREG-0654 or it should be demonstrated that such an appendix is unnecessary because its functions are performed in some other way by the present form of the plans.

The average emergency plan "should consist of perhaps hundreds of pages, not thousands." NUREG-0654, Appendix 1, at 1-29. The plan should be such a length as to permit the whole planning scheme to be grasped in one view, and to permit a sound judgment on whether the plan can be implemented in an emergency. But a document of such relatively short length will not contain enough information for implementing the plan. The plan must therefore be supplemented with implementing procedures of often changing detail — step-by-step procedures, lists of names and numbers and the like — detail not suitable for inclusion in the plan itself, and seldom suitable for litigation before licensing boards (see *Louisiana Power and Light Co. (Waterford Steam Electric Station, Unit 3)*, ALAB-732, 17 NRC 1076, 1106-07 (1983)). Such detail generally cannot be achieved until late in the planning. The implementing procedures for the onsite plan, for instance, can be submitted to the NRC as late as 180 days before the issuance of an operating license. 10 C.F.R. Part 50, Appendix E, § V.

Evaluation Criterion IL.P.7 of NUREG-0654 says,

Each plan shall contain as an appendix listing, by title, procedures required to implement the plan. The listing shall include the section(s) of the plan to be implemented by each procedure.

When we admitted the contention, we said, "[p]resumably the goal of P.7 is to assure not only that the implementing procedures are prepared in advance of plant operation above 5% of rated power, but also to assure coordination between the plans and the implementing procedures." And we might have added that the list P.7 calls for would also aid development and review (including periodic review) of the plan. Indeed, this latter consideration was very likely uppermost in the minds

of the drafters of P.7, for the ultimate authority for the requirement for such an appendix is the planning standard on plan development and review, 10 C.F.R. § 50.47(b)(16): "Responsibilities for plan development and review and for distribution of emergency plans are established, and planners are properly trained."

In August 1984, no appendix as called for by Evaluation Criterion P.7 was in either the State plan or any of the four county plans. Nor was it clear that the Applicants understood that such a plan might be required. For instance, Annex H of the plans, the Plan Cross-Reference, cited as fulfilling P.7 either very general sections of the plan, such as "Concept of Operations," or other annexes dealing only with notification.

We therefore admitted the contention in our order, LBP-84-29B, 20 NRC 389, 408-09 (1984). The Applicants moved for summary disposition on January 14, 1985. Accompanying the motion was an affidavit from Jesse T. Pugh, III, Director of the Division of Emergency Management, in the North Carolina Department of Crime Control and Public Safety. Mr. Pugh is responsible for North Carolina's emergency planning and emergency response preparedness, for both nuclear and nonnuclear emergencies. The Staff filed in support of the motion on February 27, 1985. Accompanying the Staff's filing was an affidavit from Thomas I. Hawkins, Emergency Management Program Specialist for the Federal Emergency Management Agency (FEMA), and FEMA Region IV Liaison with both South and North Carolina. The Intervenor, Wells Eddleman, replied in opposition to the motion on March 11, 1985.

The Applicants argued that the level of detail in the plans, together with the existence of standard operating procedures at the State and county levels, made an appendix linking the implementing procedures and the plans unnecessary. See LBP-84-29B, *supra*, 20 NRC at 409.

But the Applicants' principal argument, with which the Staff agrees, is that Attachment 2 to each of the five plans meets the requirement of Evaluation Criterion P.7. Attachment 2 to the State plan may be taken as typical of the other four such attachments. It lists by title five emergency plans and their sources — as, for instance, "Southern Mutual Radiation Assistance Plan," the source of which is the Southern States Energy Board. The attachment also lists three sets of Standing Operating Procedures (SOPs) and their sources — as, for instance, "State Emergency Response Team Standing Operating Procedures," the source of which is the North Carolina Division of Emergency Management, DCCPS. The Applicants concede that, as presently constituted, these attachments do not, as P.7 would have them do, list the plan sections being implemented by the listed plans and SOPs, but the Applicants nonetheless argue that P.7 is satisfied by the fact that the titles of

the plans and SOPs indicate the plan sections they implement. For instance, the Emergency Operating Center SOPs clearly indicate the part of the State plan which has to do with the functions of the Emergency Operating Center.

We believe that the listings in the various Attachment 2s are much too general to be of much use as cross-references between the plans and the implementing procedures. Rather, those Attachments are clearly intended to satisfy Evaluation Criterion P.6, which says, "[e]ach plan shall contain a detailed listing of supporting plans and their source." Indeed, Annex H, the Plan Cross-Reference, explicitly identifies the various Attachment 2s as satisfying P.6, not P.7.

In response to the Applicants' argument, the Intervenor quite rightly says that the assumption upon which the contention is based — that P.7 has not yet been satisfied — is true. Nonetheless, we are granting the motion for summary disposition, but we are also imposing a condition — to be set out in a moment — on the issuance of the full-power license. Despite the Applicants', the Staff's, and FEMA's attempts to persuade us that the various Attachment 2s satisfy Evaluation Criterion P.7, we believe that the Applicants grasp the meaning of P.7 and understand that each Attachment 2 falls short of what P.7 calls for, not only in the amount of detail in the lists in the attachment, but also in not explicitly citing sections of the plan. The Applicants do not argue that such cross-references as P.7 calls for would not be useful, or that the goals of P.7 are met by some alternative comparable in the amount of detail and degree of explicitness to what P.7 calls for. Indeed, the Applicants explicitly commit, in the course of the motion (see Motion at 10; Pugh Affidavit, ¶ 7), to satisfying P.7 fully by the time of the full-scale exercise of the emergency plans, which, at the time of the motion, was scheduled for May of this year.

We secure this commitment by imposing its fulfillment as a condition of the issuance of a full-power license. The Staff is charged with determining that before the issuance of a full-power license there has been added to the State plan and each of the county plans an appendix listing the implementation procedures for that plan. The listing must be in at least as much detail as the list of titles of Corporate Emergency Plan Implementation Procedures (CEPIP) in the October 1984 onsite plan, but each appendix must also cite by section, or sections, the parts of the plan the listed procedures implement. This condition is clear and straightforward and thus we believe we can assign oversight of its completion to the Staff, without running afoul of the delegation doctrine as developed in NRC case law. See *Southern California Edison Co.* (San Onofre Nuclear Generating Station, Units 2 and 3), LBP-82-39, 15 NRC

1163, 1216-17 (1982); *Commonwealth Edison Co.* (Byron Nuclear Power Station, Units 1 and 2), LBP-84-2, 19 NRC 36, 209-13 (1984). Therefore there is nothing left to litigate under this contention.⁷

Contention 30

The text of the contention is as follows:

The plan's provisions (Part I pp. 49-50) for Potassium Iodide do not comply with the requirements of NUREG-0654 II.J.10.e (pg. 63) that the plans must include "quantities" for persons whose "evacuation may be infeasible or very difficult" who are in the plume EPZ.

The full text of the evaluation criterion the contention cites is as follows:

10. The organization's plans to implement protective measures for the plume exposure pathway shall include:

e. Provisions for the use of radioprotective drugs, particularly for emergency workers and institutionalized persons within the plume exposure EPZ whose immediate evacuation may be infeasible or very difficult, including quantities, storage, and means of distribution.

The authority for this criterion is the planning standard in 10 C.F.R. § 50.47(b)(10), which says, among other things, that "[a] range of protective actions have [sic] been developed for the plume exposure pathway EPZ for emergency workers and the public."

Section IV.E.6 of the State plan assigns to the Division of Health Services the task of determining how much potassium iodide (KI) would be required in an emergency, but no provision in the plan says what amount of KI would be enough. We admitted the contention because we wondered whether the evaluation criterion in question shouldn't be read more literally, since NUREG-0654 often calls for definite quantities to be included in the plans. Presumably, the purpose of such calls is to make sure that the quantities are determined during, not after, the planning process. "Further Rulings on Admissibility of Offsite Emergency Planning Contentions," June 14, 1984, at 21-22.

⁷ The Intervenor complains in his reply that it is clear that some implementing procedures are not in the plans, and that some sections of the plans which require implementing procedures may not yet have them. As we said when we admitted this contention, there is no requirement that the implementing procedures be in the plans. To the contrary, see LBP-84-298, 20 NRC at 408. Nor is there any deadline for the drafting of procedures other than the natural deadline imposed by the full-scale exercise of the plans. What we seek is reasonable assurance that P.7 will be satisfied.

The Applicants filed for summary disposition on January 14, 1985. Accompanying the motion was an affidavit from Charles D. Reed, Pharmacist in the Adult Health Services Section of the Division of Health Services of the North Carolina Department of Human Resources. Mr. Reed has responsibility for the coordination of, and planning for, the procurement, storage, and distribution of KI for use in an emergency. The Staff responded in support of the motion on February 2, 1985. Accompanying the Staff's response was an affidavit from Thomas I. Hawkins, who, as we have reported before, is Emergency Management Program Specialist for the Federal Emergency Management Agency (FEMA) and the FEMA Region IV Liaison to South and North Carolina. The Intervenor, Mr. Wells Eddleman, replied in opposition to the motion on March 11, 1985.

The Applicants argue that it is cumbersome to keep the plans up to date on the quantities of KI required and stored, that these quantities are, for a number of reasons, among them changes in population density, subject to frequent change. Reed Affidavit, ¶ 6. The Applicants are, in effect, arguing that the information called for by J.10.e belongs in an implementing procedure, not in a plan. And, in fact, the State appears to treat this information, and related information, very much in the manner in which it treats implementing procedures: Affiant Reed reports that the Division of Health Services frequently distributes to State and local officials updated names of the locations where KI is stored, the quantities of KI stored at each location, and the names, addresses, and telephone numbers of the persons with access to the KI stored at each location. Reed Affidavit, ¶ 6.

The Applicants argue in the alternative that the quantities of KI which would be needed in an emergency have, in fact, been determined. Reed Affidavit, ¶ 2. As we said above, to assure that such a determination was made early on in the planning was the point of Evaluation Criterion J.10.e. No party to this proceeding has argued otherwise. When dealing with an evaluation criterion, the aim of the criterion is more important than the letter, since an applicant's compliance with a criterion is not required if the applicant can show that there is another way to satisfy the aim of the criterion. See *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit 1), ALAB-698, 16 NRC 1290, 1298-99 (1983).

The Intervenor now proposes that we litigate the *adequacy* of the quantity the State has determined it would need in an emergency. Intervenor's Reply at 5. Again, the Intervenor is proposing a new contention, one which could have been timely filed and a basis for it proffered. The Intervenor proffers none now.

heard in the Fall of 1984. It resolves those contentions in favor of the Applicants and adversely to the Intervenor. The Decision also has the effect of making other dispositive Board rulings on safety contentions — i.e., rulings granting summary disposition motions or rejecting proposed contentions — ripe for appellate review.

Hearings were held on certain emergency planning contentions in June 1985 and the remaining emergency planning contention is scheduled to be heard in September. The Board anticipates that a final partial initial decision will issue late this year and resolve emergency planning and all other remaining contentions.

II. MANAGEMENT CAPABILITY

A. Background

The ability of Carolina Power & Light Company to manage the Shearon Harris facility — often referred to as "management capability" — had been a principal area of controversy at the construction permit stage. Although the construction permit Licensing Board found that CP&L management could construct Shearon Harris safely, it was not then in a position to determine management capability to operate the facility. However, that Board, the Appeal Board, and, ultimately, the Commission adopted somewhat different approaches to the same end — that management capability would receive more than routine Staff review at the operating license stage.¹ In response to the Commission's direction, the NRC Staff performed a special "preliminary assessment" of CP&L's management capability to operate the Harris facility. This assessment was published in the *Federal Register* prior to the Notice of Opportunity for Hearing on the operating license application. See JI Exh. 38.

Possibly in response to the Staff's published assessment, several of the petitioners for intervention proposed sixteen relatively detailed "management" contentions at the initial stage of this proceeding. LBP-82-119A, 16 NRC 2069, 2075 (1982). In order to simplify and consolidate these contentions, the Board encouraged the petitioners, the Applicants and the NRC Staff to negotiate stipulated management conten-

¹ The Licensing Board conditioned the construction permit on a demonstration by the Applicants of their management capability in a hearing at the operating license stage. See LBP-79-19, 10 NRC 37, 98 (1979). The Appeal Board invalidated that condition, but directed the Staff to prepare a preliminary assessment of management capability at that stage. ALAB-577, 11 NRC 18, 36 (1980). The Commission reversed that Appeal Board order as beyond that Board's delegated authority, but adopted that Board's relief as its own. CLI-80-12, 11 NRC 514 (1980).

must choose an adverse condition which is both severe and not too infrequent in the plume EPZ under consideration. *Id.* The requirement for such estimates is in 10 C.F.R. Part 50, Appendix E, § IV, the introductory paragraph, and the ultimate source for the requirement is 10 C.F.R. § 50.47(b)(10), which says, in relevant part, "[a] range of protective actions [has] been developed for the plume exposure pathway EPZ"

The adverse weather assumed in the Applicants' time estimates is a severe rainstorm. Snowstorms are too infrequent around Shearon Harris to be usefully assumed in a time estimate. On average, each year only 7.5 inches of snow falls in that area of North Carolina, 2.5 of those inches in January, and 2.4 inches in February. McFeaters Affidavit at 2. Moreover, on average each year there are only 4 days in which there is any freezing rain. *Id.* at 3. However, the population of the plume EPZ is at its highest in the Fall, when adverse weather of any severity is likely to be in the form of rain. Urbanik Affidavit, ¶ 4.

Nonetheless, the State is well-prepared to clear the roads for evacuation in a snowstorm, if evacuation were to be the dose-saving protective action under such circumstances. The North Carolina Department of Transportation maintains close communication with the National Weather Service and has crews on standby around the clock in every county which overlaps the EPZ. The Department has fifty pieces of equipment in those counties — one piece for every 12 miles of highway in the plume EPZ — assigned for use in a general emergency caused by an accident at the plant. Adams Affidavit at 2-4. Thus, if such an emergency were to coincide with a large snowstorm, the Department would be prepared to begin simultaneous clearing of all the roads in the plume EPZ — and of the major evacuation routes outside the plume EPZ — when the first snow fell. *Id.*

Affiant Adams estimates that, for any storm dumping up to 6 inches of snow, it would take between 2.5 and 4 hours to clear all the roads needed for evacuation. In that time, every major U.S. or State road in the plume EPZ, and every major route beyond the 10-mile zone and leading to an evacuation shelter, could be scraped twice, and every other road within the 10-mile limit scraped once. Adams Affidavit at 3-4.

In its reply to the motion, CHANGE raises no objection to the adverse weather assumptions in the time estimates, and moreover says that "[i]t appears that the concerns of the contention have been adequately addressed, insofar as it addresses the effects of snow and ability of the State to clear the snow and ice from the roads." However, CHANGE goes on to say that "[i]mplicit in the contention . . . is the effect of snow and ice on the ability of drivers of poorly equipped cars to deal with treacherous conditions and the ensuing difficulty in effectively clearing

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PARTIAL INITIAL DECISION ON SAFETY CONTENTIONS

I. INTRODUCTION

The factual and procedural background concerning this contested operating license case are set forth in our first partial initial decision on environmental issues, LBP-85-5, 21 NRC 410, 412-14 (1985). This Partial Initial Decision addresses most of the safety contentions that were

for these daily tasks is assured by regulations issued by the State Department of Public Education. These regulations set out standards for the student driver's health, vision, hearing, size, strength, age, character, and attitude. Motion at 5. Prospective drivers must also take a training course in driving school buses.

In an emergency caused by an accident at the Shearon Harris plant the school bus drivers would, as they do daily, pick students up at the schools and drop them off somewhere else, at assigned shelters in the case of an emergency. At least one school staff member would be on each bus to supervise the student passengers. Pugh Affidavit, ¶ 7. Neither student drivers nor adult ones would be asked to return to the EPZ; after arriving at the shelters the student drivers would be free to join their parents. Pugh Affidavit at 4 n.2; ¶ 6. Thus the student drivers would have faced no greater risk of exposure to radiation than their passengers would have, and very likely less risk than the general public would have faced, since the schools would probably receive notification for evacuation sooner than the general public would. *Id.* ¶ 6.

For these emergency tasks so little different from their nonemergency tasks, the school bus drivers, both student and adult, will receive adequate training. They will know which shelter they should drive to, and what route to take to get there. *Id.* ¶ 8. They will be instructed in certain concepts about radiation. *Id.* They will be given some overview of the emergency plans so that they will be able to understand better their own role in the plans. *Id.* And they will be urged to discuss their roles with their families so that they and their families can make arrangements which are consistent with the roles the driver would play in an emergency. *Id.* The plans also provide for refresher training. *Id.* Affiant Dr. Mileti claims that the historical record on emergency response shows that persons well-trained in their emergency roles perform them well in time of emergency and that high school students have demonstrated a particular willingness to perform emergency roles. Mileti Affidavit, ¶ 5. He also argues that student drivers, being neither parents nor spouses, would be less likely than older drivers would be to be caught between conflicting duties. *Id.* ¶¶ 3-4.

The Applicants also argue that requiring parental authorization for student drivers to perform their roles in an evacuation would not increase the reliability or the quality of the performance of the student drivers, and therefore would not contribute to the health and safety of the students who would be passengers on the buses. Motion at 11-12. Nor, the Applicants argue, would such authorization contribute to the health and safety of the drivers themselves, for even if they were not permitted to drive the buses, they would still ride in them and thus would face exactly

Emergency Planning Joint Contention EPJ-1

The text is as follows:

Insufficient consideration has been given in the off-site Emergency Plans to the effects of severe snow and ice conditions on evacuation times and/or capabilities to clear evacuation routes.

Section IV.E.8 of the State plan (at 50) is deficient because the state does not have enough snow plows in this area to effectively clear the roads of snow or ice in a reasonable amount of time.

We admitted this contention during the May 2, 1984 prehearing conference, at Tr. 974-75, 993-96. The Applicants filed their motion for summary disposition on December 10, 1984. Accompanying the motion were three affidavits. Affiant Brian D. McFeaters is Project Scientist and Meteorological Supervisor with Applicant Carolina Power and Light Company. He has direct supervisory responsibility for all meteorological studies, monitoring, and assessment in that Applicant's Operational Training & Technical Services Department. Affiant M.C. Adams is Manager of the Maintenance and Equipment Branch of the Division of Highways, in the North Carolina Department of Transportation. He has responsibility for overseeing and maintaining the roads throughout the state, including those in the counties which overlap the plume exposure pathway EPZ. The third affiant was Robert D. Klimm, whose professional qualifications we briefly describe in our discussion of Contention 215.

The Staff and the Federal Emergency Management Agency (FEMA) filed a joint response in support of the motion on January 16, 1985. Accompanying the response were two affidavits, from Dr. Thomas Urbanik II and Thomas I. Hawkins. We briefly describe the professional qualifications of both men elsewhere in this Decision, of Dr. Urbanik in our discussion of Contention 215, and of Mr. Hawkins in our discussion of Contention 213a. Intervenor CHANGE replied in opposition to the motion on March 11, 1985. Cosponsoring Intervenor Dr. Richard D. Wilson and the Conservation Council of North Carolina (CCNC). We had designated CCNC as lead intervenor. See LBP-84-29B, 20 NRC at 420.

Section IV.A of NUREG-0654, Appendix 4, calls for evacuation time estimates to be calculated for at least two weather conditions, normal and adverse. There cannot possibly be an estimate calculated for every possible weather condition. Rather, in order to give those who would have to choose between sheltering and evacuation some reliable notion of the effect of adverse weather on evacuation times, the estimators

Klimm. We briefly describe the professional qualifications of all three men elsewhere in this Decision, of Mr. Pugh in our discussion of Contention 213a, and of Dr. Mileti and Mr. Klimm in our discussion of Contention 215. The Staff and the Federal Emergency Management Agency (FEMA) filed a joint response in support of the motion on February 27, 1985, with an affidavit from Thomas I. Hawkins, whose professional qualifications we briefly described in our discussion of Contention 213a. CHANGE replied in opposition to the motion on March 11, 1985.

The Applicants argue first that the evacuation of the schools would probably be well under way by the time parents and other members of the general public received notification of a general evacuation, since notification to the schools, both public and private, would precede, to some extent, notification to the general public, and the buses and drivers needed for evacuation of a given school would already be at the school as a matter of daily routine, or at least at a nearby school. Pugh Affidavit at 3.

The Applicants argue second that parents well-informed about what is being done for their children's safety would not be likely to try to pick their children up at school. According to Dr. Mileti, if parents are informed well in advance about the plans' provisions for the evacuation of their children, and informed at the time of an emergency that those provisions are being carried out and that parents should proceed to the shelter assigned them, there is no reason, in light of the historical record on the response of the public in general emergencies, to expect what some choose to call the "thin veneer of civilization" to be stripped away and parents to show up in great numbers at the schools, in panic and needing to be subdued by police. Mileti Affidavit at 3-4. Affiant Pugh reports that parents will indeed be informed about plans for the evacuation of schoolchildren; the public information brochures to be distributed throughout the plume EPZ will describe those plans, as will planning personnel at Parent-Teacher Organization meetings at every school in the plume EPZ. Pugh Affidavit at 4 n.2; ¶ 4. In the event of an emergency, the Emergency Broadcast System would inform parents about the evacuation of the schools, report the names of the shelter to which each school's students had been evacuated, and urge parents not to try to pick their children up at school. *Id.* at 3.

Nonetheless, the plans make some provision for parents' trying to unite with their children before evacuation. Parents who do go to the schools will, of course, be permitted to pick up their children. *Id.* at 5 n.3. Personnel at each school will be trained to deal with the traffic. All the schools in the plume EPZ have multiple entrances and exits, with the entrances parents normally use to pick their children up separate

roads within the time parameters specified." The issue CHANGE raises here is new in this proceeding and can have no effect, either procedural or substantive, on our ruling on summary disposition. Moreover, the issue is late and pleaded without basis, and it has no bearing on the adequacy either of the evacuation time estimates — about which CHANGE now raises no objection — or the adequacy of the State's preparations for clearing the roads of snow and ice.

Emergency Planning Joint Contention 4(a)

The text of the contention is as follows:

Section E4d of State Procedures (p. 47) is deficient because — Fifty percent of school bus drivers are high school juniors and seniors (as young as 16½ years). They should not be expected to perform as emergency personnel without explicit and specific authorization from their parents. Even with such authorization they should not be trusted to perform in emergency situations.

Of the seventy-five drivers planners judge would be needed to evacuate the public and private schools in the plume EPZ, about sixty-six would be high school students licensed to drive school buses. Pugh Affidavit, ¶ 3. We admitted the contention in LBP-84-29B, *supra*, 20 NRC at 420-21. Cosponsoring intervenors were Dr. Richard D. Wilson and CHANGE. We designated CHANGE as the lead intervenor.

The Applicants filed for summary disposition on January 11, 1985, with affidavits from Jesse T. Pugh III, and Dr. Dennis S. Mileti. We briefly describe the professional qualifications of Mr. Pugh in our discussion of Contention 213a, and of Dr. Mileti in our discussion of Contention 215. The Staff and the Federal Emergency Management Agency (FEMA) responded in support of the motion on February 27, 1985, with an affidavit from Thomas I. Hawkins, whose professional qualifications we briefly describe in our discussion of Contention 213a. CHANGE replied in opposition to the motion on March 11, 1985.

The Applicants' argument, in a nutshell, is that the emergency tasks of the school bus drivers would be little different from the tasks they competently perform daily during the school year, that they will be well-informed about what would be expected of them in an emergency, and that there is no evidence in the historical record of emergency response to suggest that high school students would not perform their assigned roles.

Daily during the school year, in all kinds of weather, school bus drivers who are students drive students of all ages to and from the schools in the plume EPZ. Pugh Affidavit, ¶ 4. The student drivers' competence

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

James L. Kelley, Chairman
Dr. James H. Carpenter
Glenn O. Bright

In the Matter of

Docket No. 50-400-OL
(ASLBP No. 82-472-03-OL)

CAROLINA POWER & LIGHT
COMPANY and
NORTH CAROLINA EASTERN
MUNICIPAL POWER AGENCY
(Shearon Harris Nuclear Power
Plant)

August 20, 1985

In this Partial Initial Decision, the Licensing Board decides most of the contested safety issues, including management capability issues, in the Applicants' favor.

TECHNICAL ISSUES DISCUSSED

Accuracy of Thermoluminescent Dosimeters
Environmental Qualification of Electrical Equipment
Integrity of Containment Concrete.

APPEARANCES

Thomas A. Baxter, John H. O'Neill, Jr., Pamela H. Anderson and
Michael A. Swiger, Washington, D.C., and Richard E. Jones

the same risks of exposure to radiation their fellow students would. *Id.* at 11. The Applicants also point out that State law expressly authorizes the use of school buses "for emergency management purposes," but neither State statutes nor regulations require parental authorization for student bus drivers to drive the buses in an emergency. *Id.* at 6 (citing N.C. Gen. Stat. § 115C-242(6)).

CHANGE replies with what amount to four arguments. First, it claims that Applicants' affiant Dr. Mileti "assumes," when predicting that high school students would perform their roles well, that they will be trained in those roles. Given Mr. Pugh's affidavit and the relevant provisions of the plans, we fail to see what is questionable about this assumption. CHANGE argues second that the State Department of Public Education regulations on the qualifications of school bus drivers "appear to be at most . . . paper requirement[s] of little reliability or application in emergency conditions." CHANGE proffers no basis for this claim. CHANGE grants that "the reliability and quality of a driver's performance may not be dependent on parental authorization," but CHANGE nonetheless asserts that "parental authorization and approval are certainly important in considering issues of this nature." How important in considering which issues of what nature CHANGE does not say. CHANGE last asserts its "general experience" of students of high school age against Dr. Mileti's "general experience" of students that age, and thus invites us to prefer undocumented, unsworn claims to sworn affidavits summarizing scholarship. Again, "a party opposing the motion may not rest upon the mere allegations or denials of his answer; his answer by affidavits or as otherwise provided in this section must set forth specific facts showing that there is a genuine issue of fact." 10 C.F.R. § 2.749(b).

Contention 4(d)

The text of the contention is as follows:

Section E4d of State Procedures (p. 47) is deficient because —

Most parents would demand to pick up their children at school. The chaos at every school in the area would require all local law enforcement officers and several county officers to contain. This factor is not mentioned in the plan.

The cosponsors of this contention are Dr. Richard D. Wilson, Mr. Wells Eddleman, and CHANGE. We designated CHANGE as the lead intervenor. See LBP-84-29B, *supra*, 20 NRC at 421.

The Applicants moved for summary disposition on January 14, 1985, with affidavits from Jesse T. Pugh III, Dr. Dennis Mileti, and Robert D.

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PARTIAL INITIAL DECISION ON SAFETY CONTENTIONS

I. INTRODUCTION

The factual and procedural background concerning this contested operating license case are set forth in our first partial initial decision on environmental issues. LBP-85-5, 21 NRC 410, 412-14 (1985). This Partial Initial Decision addresses most of the safety contentions that were

from exits the buses normally use. *Id.* ¶ 6. Affiant Klimm says that although the evacuation time estimates were not calculated with the possibility in mind that parents would try to go to the schools, such trips to the schools would not invalidate the estimates, for the estimates allot ample times for preparation and mobilization, and the double-counting discussed in Contention 215 leaves some room for the traffic "friction" caused by parents' going to the schools. Klimm Affidavit at 3.

Inexplicably, CHANGE construes the Applicants' first argument to *assume* that the schools would be evacuated before parents arrive at them. CHANGE's only other argument is that we have received testimony at a limited appearance session from parents who said they would probably try to pick their children up at school. Thus we are invited to set aside, on the basis of brief, unsworn testimony about what the testifier thought he or she might do in a general emergency, sworn affidavits about how people have in fact behaved in general emergencies. "[A] party opposing the motion may not rest upon the mere allegations or denials of his answer; his answer by affidavits or as otherwise provided in this section must set forth specific facts showing that there is a genuine issue of fact." 10 C.F.R. § 2.749(b).

THE ATOMIC SAFETY AND
LICENSING BOARD

James L. Kelley, Chairman
ADMINISTRATIVE JUDGE

James H. Carpenter
ADMINISTRATIVE JUDGE

Glenn O. Bright
ADMINISTRATIVE JUDGE

Bethesda, Maryland

tions. The result was a stipulation by all parties to Joint Contention I, which reads as follows:

The Applicants have not demonstrated the adequacy of their managing, engineering, operating and maintenance personnel to safely operate, maintain and manage the Shearon Harris Nuclear Power Plant as evidenced by their record of safety and performance at their other nuclear power facilities. A pattern of management inadequacies and unqualified and/or inadequate staff is likely to be reproduced at Shearon Harris Nuclear Power Plant and result in health and safety problems.

Joint Contention I is very broad. Indeed it is so lacking in specifics that we probably would not have admitted it over an Applicant or Staff objection on that ground. In this case, however, it was apparent that a relative lack of specificity was the *quid pro quo* for a single stipulated contention, a price the Applicants and Staff were willing to pay. A principal reason for requiring specificity in contentions is to protect the opposing parties from unduly broad discovery. Because the Applicants and Staff evidenced a willingness (through their stipulations to Joint Contention I) to waive that protection here, there was no reason for the Board to insist on it. In any event, the Applicants and Staff apparently foresaw that they could adequately particularize this broad contention in the discovery process. To a large extent, that is what happened.

B. Standards

Management capability or "competence"² (as it is sometimes called) is a murky area of nuclear power regulation. The Commission, in one of its few pronouncements on the subject, has recognized "that it has not established definitive standards for management organization and operation for nuclear power plants." *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit 1), CLI-80-5, 11 NRC 408, 409-10 (1980). Acknowledging the present lack of standards, the Appeal Board has called management competence a "nebulous . . . slippery concept." *Id.*, ALAB-772, 19 NRC 1193, 1206, 1208 (1984). Not surprisingly, the few decided cases in this area do not illustrate clear "management" principles, but tend to turn on their particular facts. See *id.*, LBP-81-32, 14 NRC 381 (1982); *Carolina Power and Light Co.* (Shearon Harris Nuclear Power Plant, Units 1, 2, 3, and 4), LBP-79-19, 10 NRC 37 (1979);

² The phrases "management capability" and "management competence" are used interchangeably in this Decision and in the decided cases. Both grow out of the requirement that an applicant for an operating license be "technically qualified" to operate the facility, 10 C.F.R. § 50.40(b). That rule, in turn, derives from § 182(a) of the Atomic Energy Act, 42 U.S.C. § 2232.

Houston Lighting and Power Co. (South Texas Project, Units 1 and 2), LBP-84-13, 19 NRC 659, 669-98 (1984).

The lack of clear standards for "management capability" becomes less significant, however, when it is recognized that in a particular case that phrase may be little more than a loosely descriptive label for certain kinds of fairly specific problems that can arise at a nuclear power plant. So viewed, a "management competence" label can be similar to the "safety," "environmental" and "emergency planning" labels Boards have become accustomed to using as convenient demarcation lines for segregable parts of big cases. For example, in the "management" phase of the TMI Restart proceeding, the Commission raised a series of relatively detailed questions for exploration by the Licensing Board — e.g., whether the Unit 1 health physics program and radiation waste system were appropriately staffed with qualified individuals to ensure the safe operation of the facility. CLI-80-5, *supra*, 11 NRC at 409. Presumably, these questions could have been raised as separate "safety" issues in the case without any explicit reference to "management capability."³ Similarly, in the present case and for the most part, the Intervenor's concerns about CP&L management eventually focused upon reasonably specific areas, such that the parties were fairly called upon to respond to them, and the Board is now in a position to make reasonably specific findings, based on the hearing record.

C. Management — General Considerations⁴

The Applicants presented a panel of high-level management officials to testify about CP&L's management structure for nuclear activities and related matters, including E.E. Utley, Executive Vice President, Power Supply, Engineering and Construction, and M.A. McDuffie, Senior Vice President, Nuclear Generation Group. See Applicants' Joint Testimony of Utley, McDuffie, Elleman and Banks on Contention I, ff. Tr. 2452, at 1-5. These panel witnesses have extensive experience in nuclear matters generally and in CP&L's nuclear activities in particular. For example, Mr. Utley has been a senior management officer of CP&L since 1972, and is currently Chairman of the Evaluation and Assistance Division of the Institute of Nuclear Power Operations (INPO). Mr. McDuffie has 17

³ So too, in this case the Intervenor's particular concerns — although related in one way or another to "management" — could have been heard individually as "safety" contentions. Conversely, a contention like Eddleman Contention 41, which was labeled a "safety" contention, might have been heard as a "management" contention in light of widespread problems in the pipe hanger inspection process. See Testimony of Paul Bemis, ff. Tr. 3660, at 22.

⁴ This section incorporates the Board's findings of fact and conclusions of law on Joint Contention I. Cf. Fed. R. Civ. P. 52(a).

years of nuclear plant construction experience; he has been a senior management officer of CP&L since 1974.

It is not necessary for us to describe CP&L's organizational structure and functional relationships in detail. We include such description only as necessary to provide a context for the Joint Intervenor's criticisms in the management area.

Like all corporations, CP&L is headed by a Board of Directors. The Board has ten "outside" Directors; four corporate officers also serve as "inside" Directors.⁵ Sherwood H. Smith, Jr., is the Chairman of the Board, President and Chief Executive Officer of CP&L and, as such, oversees all of the company's operations. Utley Testimony at 7. Mr. Smith has been a member of CP&L senior management since 1971, when he was named Senior Vice President and General Counsel. Smith, Tr. 3906. He devotes a substantial portion of his time to CP&L nuclear activities and to national nuclear industry activities. Tr. 3919-21, 3924-26.

The Intervenor asks us to find, without any record citation, that "reliance on one person [Mr. Smith] for the three top positions has the potential to preclude effective change in response to problems in nuclear operation." Joint Intervenor's Proposed Finding (JI PF) 10. The Board declines. In the first place, it is unclear whether Mr. Smith actually holds three separate corporate positions. His testimony suggests that he is "Chief Executive Officer" by virtue of his being President of the company. Smith, Tr. 3906. In any event, there is no evidence in the record to support the Intervenor's proposition. On the contrary, it is not uncommon for senior corporate officers to wear two or more hats, some of which may be largely titular. Smith, Tr. 3914. Overall, the Board was favorably impressed with Mr. Smith's appearance as a witness. See Tr. 3907-36. We have no reason to think that CP&L's nuclear activities will suffer as a result of Mr. Smith's having more than one title in the company.

⁵ In 1982, at the request of the North Carolina Public Utilities Commission, a firm of management consultants reviewed CP&L's activities and made a number of recommendations for change, about half involving "management process improvements opportunities." The first such recommendation was that CP&L include on its Board "outside" directors having nuclear experience. In 1984, CP&L reported to the Utilities Commission that the status of the "outside nuclear director" recommendation was "completed." JI Exh. 14, at 3. However, Mr. Utley testified that there is no outside director with nuclear experience on the CP&L Board. We were told that the intent of the status report was to reflect the hiring of a particular individual with extensive experience in nuclear activities as a consultant to the Board. Utley Testimony at 7, Tr. 2797; Smith, Tr. 3910-13. The Board finds CP&L's report to the Utilities Commission on this recommendation misleading even taking into account Applicants' Exhibit 3, which provided a fuller explanation. Nevertheless, we attach no substantial significance to this matter, in and of itself, nor does any other evidence tend to prove a proclivity to make misleading statements to regulatory authorities.

Mr. Utley, as Executive Vice President for Power Supply, Engineering and Construction, reports to Mr. Smith. Five organizations, each headed by a Vice President, are involved in CP&L's nuclear power activities and report to Mr. Utley. These organizations are the Nuclear Generation Group (headed by Mr. McDuffie), the Brunswick Nuclear Project, the Operations Support Group, the Corporate Nuclear Safety and Research Department, and the Corporate Quality Assurance Department. Two of the five groups — Nuclear Generation and the Brunswick Department — are concerned solely with nuclear activities. Utley Testimony at 8-11. The other three groups support all of CP&L's generating activities, including coal, hydro and petroleum fired plants. CP&L has approximately fifteen nonnuclear generating plants employing about 1000 people.

A provision of the Staff's Standard Review Plan (SRP) states that: "A corporate officer should clearly be responsible for nuclear activities, without having ancillary responsibilities that might detract from his attention to nuclear safety matters."⁶ The Intervenor correctly point out that "the only CP&L corporate officer responsible for all nuclear activities is Mr. Utley, who is also responsible for all fossil generation, transmission and distribution for the company." JI PF 28. The Intervenor further point out, again correctly, that "this does not meet the Standard Review Plan acceptance criteria." *Id.* However, the Staff's Standard Review Plan does not rise to the level of a binding regulation. Like Regulatory Guides, the Standard Review Plan merely reflects the Staff's position on how one aspect of an Applicant's technical qualifications should be judged. Furthermore, the Staff is free to waive criteria in its Standard Review Plan if, under the circumstances, it is nevertheless satisfied with the Applicant's organizational structure. That is what happened in this case.

Staff witness Bemis testified that "the Staff finds . . . the present organization within CP&L is acceptable . . . although further nuclear consolidation is desirable." Bemis Testimony, ff. Tr. 3660, at 36. More specifically, Mr. Bemis testified that:

The Corporate Quality Assurance and the Corporate Nuclear Safety and Research Departments report to the Executive Vice President, PSE&C rather than to the corporate officer who has primary responsibility for nuclear support activities, which appears to be common industry practice. The reportability of the departments was determined by the applicant to give these departments additional independence. However, not only does this place excessive direct responsibility on the Executive

⁶ SRP 13.1.1, quoted in Bemis Testimony, ff. Tr. 3660, at 36.

Vice President who is already responsible for the largest majority of the company employees and operation, it also removes the day-to-day decision-making capabilities involving interface with the departments from the corporate officer who is considered as the primary corporate officer for nuclear support activities. The staff finds this reportability to be acceptable for the three sites at this time. However, the staff will continue to review this organization in practice.

Id. at 37. The Staff considered it significant that in August 1983, only a year before its testimony in this case, CP&L had undergone "a major restructuring of the corporate organization" which had been explained to NRC as "a major step in CP&L's movement toward nuclear consolidation in the CP&L organization." *Id.* at 30. Mr. Bemis went on to outline the major features of these changes and their rationale. *Id.* at 31-35.

Mr. Utley provided further details about the recent changes, most notably the assignment of a corporate officer (or manager with the status of a department head) to each of the three nuclear plant sites to manage activities at that site. The principal purpose of this change had been to "provide firmer management control over and greater accountability for activities at the plant." Mr. Utley regarded this change as the "single most important improvement . . . CP&L has made in the way in which it manages its nuclear program." Utley Testimony at 34.

In view of the recentness and significance of these changes, the Staff decided to give its qualified approval to them at this time. The Staff also promised to "closely monitor . . . to determine whether actual performance is clearly demonstrated during major evaluations." Bemis Testimony at 38.

Based in part on the Staff's assurance that it will monitor the practical working of the recent changes in the CP&L organization, this Board accepts that structure, as it has been presented to us. That structure appears to be reasonable and calculated to focus prompt, high-level management attention on safety concerns as they arise. The Intervenor propose no finding that the CP&L organizational structure does not meet any binding licensing standard. Nor, except as already discussed, do they direct us toward any record evidence calling that structure into question.⁷

⁷ The Joint Intervenor propose a finding that senior management personnel do not receive written evaluations of their performance. JI PF 22. While the record supports that fact, we see little relevance to the issue of technical competence. Joint Intervenor's Proposed Finding 23 seeks to fault Mr. Smith for taking into account the performance of the nuclear units in his evaluation of Mr. Utley, as distinguished from an evaluation based solely on safety considerations, apparently without regard to cost. Mr. Smith made it clear that top-level management officials are evaluated under various criteria; he testified, however, that "you have to start with their safe performance . . . safety to the public has to come first." Smith, Tr. 3917. The implication that management officials should be evaluated solely on the basis of safety, without regard to such things as output, schedules or cost, is not merely unrealistic, but fatuous.

(Continued)

D. Brunswick — General

Apart from general management considerations, the testimony and exhibits largely focused on particular aspects of the Applicants' management of its Brunswick facility and on the Applicants' ratings in the Staff's annual "Systematic Assessment of License Performance" (commonly called "SALP Reports") for 1981-84. The pertinent history at Brunswick and these SALP Reports are closely interrelated. For the sake of clarity, we turn to the Brunswick history first.

Applicants' testimony concerning Brunswick came principally from Mr. Utley (Testimony at 29-33) and from the current senior CP&L managers at Brunswick — Patrick Howe, Vice President-Brunswick Nuclear Project, and C.R. Dietz, General Manager-Brunswick Plant. See Howe/Dietz Testimony, ff. Tr. 3124. The senior managers and the organizational structure presently in place at Brunswick are pertinent, not in and of themselves, but for what they say about the Applicants' willingness and ability to identify management problems and to implement corrective action in a timely manner.

Both Mr. Howe and Mr. Dietz have extensive training and experience in the nuclear field. Mr. Howe has some 30 years of nuclear experience, including senior positions at the Lawrence Radiation Laboratory, the Atomic Energy Commission and CP&L. Mr. Dietz has held a variety of responsible positions in the nuclear industry. Howe/Dietz Testimony at 1-3. Messrs. Howe and Dietz spoke on the basis of first-hand experience about the Brunswick plant and, generally, the Board found their testimony persuasive. Messrs. Howe and Dietz testified in some detail about the present organization and staffing of the Brunswick Nuclear Project. *Id.* at 1-10. The record reflects that the *present* organization and staffing at Brunswick are adequate. However, an earlier period at Brunswick, from about 1977 until late 1982, raises questions about CP&L's management competence, not only at that facility, but in all its nuclear operations.

E. The NRC Staff's View of Brunswick

The NRC Staff's principal witness on the management contention was Paul R. Bemis, a Section Chief in the NRC's Atlanta Office. Mr. Bemis was very well qualified to address the management contention. His

Intervenors ask us to find that "only limited personnel actions" have been taken in response to violations of NRC regulations. JI PF 25. There is insufficient evidence in the record to make any generalizations about this subject. Joint Intervenors' Exhibit 17 indicates that more regulation violations occur at operating plants (Robinson and Brunswick) than at a construction site (Harris). That would not be surprising, but it proves nothing about the Applicants' managerial competence.

general background and experience were set forth in his extensive testimony. Furthermore, for approximately 2 years preceding the hearing, Mr. Bemis was directly responsible "for managing the performance of the NRC inspection and enforcement program at all of the CP&L facilities." Bemis Testimony at 6. Mr. Bemis explained this unusual assignment, as follows:

In the fall of 1982, the Regional Administrator and his top management staff decided that due to numerous continuing problems at CP&L facilities, in particular the Brunswick site, a break from a conventional NRC management style was required and a radical management style would be put into place Rather than managing solely from the Regional Office I was detailed to observe first hand the operations at the individual nuclear sites and corporate office. During the first six months of this new assignment, I spent approximately 85% of my normal work time assignment at CP&L nuclear sites and the corporate office evaluating: the management at the nuclear sites, and at the corporate office; plant operation, including support groups; and progress of the Brunswick and Robinson Improvement Programs to ensure that lessons learned from these programs were implemented at Harris. During the past year, I have been evaluating the programs put in place to ensure that progress is being achieved, evaluating implementation of the new corporate and site organizations including individual managers, and following closely the Robinson Steam Generator Repair Project, the implementation of the Brunswick and Robinson Improvement Programs, and the construction progress at the Harris facility.

Among other matters, Mr. Bemis testified in some detail concerning the following areas of concern at Brunswick.

1. Enforcement History

According to Mr. Bemis, "Brunswick's enforcement history has been poor." *Id.* at 15. (This assessment is also indicated by prior SALP ratings, as discussed further below.) Mr. Bemis singled out a civil penalty of \$600,000 -- the largest penalty levied by NRC to that date -- associated with certain surveillance and quality assurance activities. *Id.* See *JI* Exh. 18. He testified that:

Originally, it was thought that only a few surveillance requirements were missed but after a thorough check of the Technical Specifications it was determined that a large number of Limiting Conditions for Operation could not be verified. When the magnitude of these problems was recognized, CP&L management shut down both units, performed the required verifications, and began development of the Brunswick Improvement Program (BIP).

Mr. Bemis characterized this incident as a "breakdown in management controls" (Bemis Testimony at 20), a characterization with which Mr. Smith and Mr. Utley of CP&L seemed to agree. *Tr.* 2907, 3928.

With respect to more recent trends in enforcement matters, however, Mr. Bemis testified that "my review of enforcement history of CP&L sites indicates violations are becoming fewer in number. More importantly, the level of severity of the violation is decreasing." Bemis Testimony at 18. He further concluded that violations at the Harris plant over the past 3 years, for the most part, "did not represent programmatic or management control system failures." *Id.* at 20.⁸

2. Other Brunswick Problems Relevant to Management Competence

Mr. Bemis also cited certain other Brunswick problem areas he considered pertinent to future operation of Harris. For several years, Brunswick had a relatively small operating staff which had led to high turnover rates, long working hours and generally poor staff morale. These factors undoubtedly made it difficult to attract and retain qualified personnel. Mr. Bemis noted, however, that "due to management directed changes at Brunswick of the past 18 months, employee morale has improved and site attrition has dropped from greater than 11% to less than 4% per year." *Id.* at 25. As Mr. Howe testified, the number of employees at Brunswick has increased dramatically, from 400 in 1980 to about triple that number at the present time. Howe Testimony at 15-16. Completion of required rework flowing from TMI requirements and equipment failures, and NRC regulations limiting working hours have reduced extended working hours. All of these related changes have improved the quality of work and employee morale. Bemis Testimony at 25-26.

Brunswick had experienced "numerous problems" in its radiation protection program. Mr. Bemis attributed these problems to "poor management control of the problem." *Id.* at 26. He testified that:

In the summer of 1980, the radiation protection problems culminated with a large civil penalty being issued for Brunswick allowing contaminated material to be dumped in a clean area. CP&L management then took decisive action by installing a new manager over the program and gave him the required backing to completely restructure the radiation protection program. Upgrading procedures, additional upgrading of equipment, and more qualified personnel were installed at the facility. This program has seen continued improvement to the present and is reflected in each SALP rating since that time. . . . The Harris program has benefited from the problems experienced at Brunswick, in that personnel are better trained from the

⁸ The Joint Intervenor also point to an incident that occurred in January 1983 involving refueling operations as evidence of programmatic deficiencies at Brunswick. JIPF 106; Tr. 3754-57. The circumstances concerning this incident were not fully developed on the record and it is unclear whether it represents an isolated incident or a programmatic deficiency. In any event, the incident occurred when the Brunswick Improvement Plan was first being implemented. In view of improvements under that plan and thereafter, we see no significance in the incident for present purposes.

beginning, a superior program will be in place at fuel load, and Harris has state-of-the-art equipment to begin operation. These items lead the NRC to conclude that the Harris radiation program will meet requirements and not have the problems experienced at Brunswick.

*Id.*⁹

3. *The Brunswick Improvement Plan*

As the foregoing discussion indicates, Mr. Bemis saw in Brunswick a disconcerting pattern of regulatory problems between the late 1970's and late 1982, followed by marked, even dramatic, improvement from then until the present time. It appears that from a management perspective these healthy changes come about partly as a result of changes in CP&L attitudes and partly as a result of strong pressure from NRC officials in Region 2. Mr. Bemis testified that:

By mid-1982, the Regional Office had concluded that no substantial program improvements had been observed since the Cantrell concerns were aired in the 1979 ASLB hearings on Harris. Therefore, the NRC insisted on a formal improvement program. The NRC gave general input to the BIP requirements. The general requirements of this program were:

- Establish a centralized tracking system to insure all regulatory requirements and commitments are met.
- Rewrite all procedures required for safe plant operation insuring technical adequacy.
- Upgrade the corporate and site QA organization.
- Continue post-maintenance testing program.
- Upgrade training and discipline of operations.
- Upgrade the corporate and site Nuclear Safety organizations.
- Implement the findings of several previous outside audits.

This program was confirmed and imposed by an NRC Order on December 22, 1982.

Id. at 15-16.

⁹ The Applicants presented testimony and proposed findings on several other aspects of Brunswick operations, including shift rotations, radwaste control and training programs. APFs 101-108. In general, the Board was favorably impressed with the Applicants' evidence in these areas. We do not make specific findings on these areas since the Intervenor's propose no such findings.

The Intervenor's cite the high number of Licensee Event Reports (LERs) at Brunswick in the 1979-82 period. JI PF 39. They fail to note, however, that LERs decreased sharply after that, a trend that conforms with our overall assessment of Brunswick management. See APF (Reply) 19. The Intervenor's also propose findings on Brunswick capacity factors. JI PF 44-45. The Intervenor's do not explain the relevance of such factors to this case, which we think is marginal.

F. Conclusions About Brunswick

Partly as a result of implementation of the Brunswick Improvement Plan, Mr. Bemis expressed a positive view about Brunswick operations, present and future. As he saw it:

The Brunswick facility has shown steady improvement over the past 18 months in management programs, control and ability to adhere to regulatory requirements. Each project improved over its predecessor indicating a management committed to improvement. CP&L acknowledged . . . NRC concerns and was able to implement corrective actions in such a way that many major improvements resulted, bringing about a more enlightened and aggressive staff attitude that was more sensitive to detail and NRC regulations than before implementation of the Brunswick Improvement Plan. CP&L recognized where weak areas existed and filled positions with capable individuals from outside the company when necessary. The result has been an improved, more closely coordinated operation, capable of performing difficult, integrated site projects. Region II feels that the Brunswick of today is significantly improved over the Brunswick of five years ago. Our aggressive inspection and enforcement program gives us confidence that CP&L will continue to improve its management and operation of its entire nuclear program.

Id. at 23. The Licensing Board agrees with the Staff's evolving assessment of management performance at Brunswick from the late 70's until the hearing in the Fall of 1984. That assessment, in its essentials, reflects poor management performance for several years, until implementation of the Brunswick Improvement Plan in late 1982. Since then, however, there has been fairly steady improvement in Brunswick management. At the present time, the record indicates that Brunswick management is basically sound.

We reach these general conclusions about Brunswick for several reasons. First, we rely substantially on the detailed and informed testimony of Mr. Bemis. He was in a unique position — based on his unusual assignment to oversee all CP&L facilities in the relevant time period — to assess Brunswick management in depth and to provide an objective viewpoint. That assessment is also supported by the weight of the other evidence. Thus, the Applicants' witnesses (although generally more favorable to the CP&L performance than Mr. Bemis) testified to much the same effect. For example, they candidly conceded that some of their past difficulties at Brunswick stemmed from management deficiencies. Tr. 2907, 3928. The Intervenor's did not present witnesses on Brunswick; responses to their cross-examination were generally consistent with the conclusions we reach here. Furthermore, the "SALP" Reports, which we discuss next, also support our conclusions about Brunswick.

G. The "SALP" Reports on CP&L Facilities

1. Introduction

For the past several years, the NRC Regional Offices have conducted annual "Systematic Assessments of Licensee Performance" of each licensee of a nuclear power plant, including an evaluation of each facility. Uniform procedures for such assessments were first formalized in 1982.¹⁰ The nature and purposes of the SALP program were summarized at that time, as follows:

SALP is an integrated NRC staff effort to collect available observations on an annual basis and evaluate licensee performance based on those observations. Positive and negative attributes of licensee performance are considered. Emphasis is placed upon understanding the reasons for licensee's performance in important functional areas, and sharing this understanding with the licensee. The SALP process is oriented toward furthering NRC's understanding of the manner in which: (1) The licensee management directs, guides, and provides resources for assuring plant safety; and (2) such resources are used and applied. The integrated SALP assessment is intended to be sufficiently diagnostic to provide a rational basis for allocating NRC resources and to provide meaningful guidance to licensee management.

Each year, a licensee's performance at each site is assessed in several functional areas — for example, plant operations, fire protection, security, refueling. On the basis of that assessment, including consideration of inspection reports, the SALP Board for that particular licensee assigns a rating for each functional area. Such ratings, in turn, call for varying levels of NRC inspection and enforcement effort, as follows:

- a. Category 1. Reduced NRC attention may be appropriate. Licensee management attention and involvement are aggressive and oriented toward nuclear safety; licensee resources are ample and effectively used such that a high level of performance with respect to operational safety or construction is being achieved.
- b. Category 2. NRC attention should be maintained at normal levels. Licensee management attention and involvement are evident and are concerned with nuclear safety; licensee resources are adequate and are reasonably effective such that satisfactory performance with respect to operational safety or construction is being achieved.
- c. Category 3. Both NRC and licensee attention should be increased. Licensee management attention or involvement is acceptable and considers nuclear safety, but weaknesses are evident; licensee resources appear to be strained or

¹⁰ See Systematic Assessment of Licensee Performance, Request for Public Comment, 47 Fed. Reg. 12,240 (1982).

not effectively used such that minimally satisfactory performance with respect to operational safety or construction is being achieved.

47 Fed. Reg. at 12,241. SALP boards are composed of Regional Office personnel particularly knowledgeable about the licensee; they receive input from knowledgeable sources, including resident inspectors at particular sites. Written input is obtained from the Office of Nuclear Reactor Regulation and other Washington offices, as appropriate. Ratings are arrived at through discussion and consensus judgments, with differences resolved by Board vote. *Id.* See Bemis, Tr. 3653-55.

One or more of the following criteria are used to evaluate performance in each functional area:

1. Management involvement in assuring quality.
2. Approach to resolution of technical issues from a safety standpoint.
3. Responsiveness to NRC initiatives.
4. Enforcement history.
5. Reporting and analysis of reportable events.
6. Staffing (including management).
7. Training effectiveness and qualification.¹¹

As can be inferred from the criteria, a conscious effort is made to assess managerial effectiveness in the various areas. In addition to assessments of individual facilities, the SALP Report contains an overall evaluation of the licensee. Following completion of the SALP Board's assessment, the licensee is given an opportunity to file written comments. Thereafter, both the Board assessment and the licensee comments, if any, are issued as an NRC Report by the Regional Administration.

The NRC Staff introduced the most recent SALP report into evidence, the 1984 Report. Bemis Testimony, ff. Tr. 3660, at 42. The three preceding reports were introduced by the Joint Intervenors. JI Exhs. 19, 20 and 21. These four SALP Reports were referred to in the hearing as SALP I-IV; they covered the following time periods:

SALP I	April 1, 1979-March 31, 1980
SALP II	July 1, 1980-December 31, 1981
SALP III	January 1, 1982-January 31, 1983
SALP IV	February 1, 1983-April 30, 1984

¹¹ JI Exh. 21, SALP III, at 1.

In the aggregate, these time periods cover the time periods of principal interest in this case. Events occurring prior to April 1979 would probably be too remote in time to have much bearing on future management ability to operate Shearon Harris.

The Joint Intervenors seek to make selective use of these SALP Reports in order to denigrate CP&L's management capability. See JI PF 32-43. As we explain hereafter, although some individual findings do not reflect very favorably on CP&L, read as a whole the SALP Reports support CP&L's claim of improved management competence. The other parties make references to the Reports, but do not rely strongly on them in their findings. This is understandable in the case of CP&L, which emphasized the testimony of their own witnesses, who occasionally disagreed with the SALP findings. See, e.g., Utley, Tr. 2969. The Staff's approach was to rely on its witness, Mr. Bemis, who made only a passing reference in his prepared testimony to the most recent SALP Report.¹²

The Board considers the four SALP Reports to be highly significant evidence on the management contention. As noted above, the reports blanket the relevant time period and therefore should reflect any significant trends. They represent the judgments of disinterested observers, as contrasted with necessarily self-serving declarations from the Applicants' witnesses. The SALP Reports are based upon expertise from a wide range of technical disciplines. For example, the Board that produced the most recent SALP Report on CP&L included four members, three of whom are Division Directors at Region II, and thirteen "attendees," among these Mr. Bemis, four Resident Inspectors, and three NRC specialists from Washington. SALP IV at 8. The reports attempt to factor in management considerations, including an overall judgment about the licensee's competence.

Before turning to the most pertinent aspects of the four SALP Reports on CP&L, we emphasize again that a rating of "3" is not a "failing grade." As we have explained, a "3" means that "minimally satisfactory performance . . . is being achieved." A "3" rating probably would result in greater inspection attention by NRC Regional personnel, but licensees can continue to operate notwithstanding a "3" rating on a safety-related function.

¹² Had the Staff chosen to rely heavily on the SALP Reports, it may have been required to produce several additional witnesses to stand cross-examination on them. That, in turn, might have strained the Staff's resources. We note in this connection that the Staff nevertheless produced more than a dozen witnesses at the 1979 remand hearing, a hearing held at the Commission's behest. See LBP-79-19, *supra*, 10 NRC at 43-44. We imply no criticism of Mr. Bemis, who was an effective witness, in observing that the Staff chose to present a modest direct case in this proceeding, compared to its command performance in 1979.

2. SALP I (1979-80)

The first SALP Report on CP&L was relatively brief and conclusory, perhaps because it was the first such assessment to be performed.¹³ SALP I did not include numerical category ratings. Because of the problems then being encountered at Brunswick, we will focus particularly on SALP I's assessments of that facility.

The Review Board stated that there had been "no adverse trends with respect to noncompliance" at Brunswick, but that "problems related to radiation protection and contamination had been observed" The Board concluded generally that "Brunswick had been responsive to NRC regulations and findings of noncompliance." The view was expressed that "the recent reorganization at the corporate and site levels appears to be providing increased responsiveness to our concerns." SALP I at 2-2. The assessment of Brunswick concluded with a discussion of an unmonitored, uncontrolled release of airborne radioactive material. However, the "Action Plan" portion of the assessment did not call for any escalated enforcement action. SALP I, App. B. The "Overall Evaluation" of Brunswick was as follows:

The performance of licensed activities was adequate during the appraisal period as compared to other Region II facilities. Subsequent performance would indicate a well below average performance as indicated by recent inspection findings in the areas of radiation control, contamination control, and environmental protection program. These areas are being closely monitored by Region II and corrective action is being taken by the licensee.

SALP I at 2-4.

The SALP I assessments of the Robinson and Shearon Harris facilities were generally favorable. Overall, Robinson was deemed to be "slightly above average as compared to other Region II facilities." Shearon Harris was rated "slightly below average," with certain deficiencies noted in the quality assurance area. SALP I at 3-3, 4-3.

In its overview of CP&L as a licensee, SALP I noted certain areas of "good performance," other areas where "improved performance is warranted," including contamination and procedural controls. The "overall evaluation" for the licensee was that:

CP&L is, in general, responsive to NRC requirements, findings of noncompliance, and information requests from the NRC. Their performance is evaluated to be

¹³ SALP I (JI Exh. 19) was 17 typewritten pages long. The subsequent SALPs were: II — 40 pages; III — 61 pages; and IV — 69 pages. Generally, each successive SALP has provided more data and analyses than its predecessor.

below average for Region II. However, their reorganization appears to be improving their performance. A continuation of this uptrend is expected.

3. SALP II (1980-81)

The SALP II Report represented the low point for Brunswick. The performance analysis for Brunswick was relatively lengthy and frequently critical. SALP II at 5-21. For example, the discussion of numerous violations in plant operations concluded that they were "examples of recurrent problems and the lack of management control in the area of plant operations." *Id.* at 5. Following a lengthy discussion of radiation control problems, the report concluded that "significant management control problems" were present. *Id.* at 13. Similarly, the analysis of certain quality assurance problems found that "insufficient management attention" had been given to that area. *Id.* at 16.

SALP II was the first SALP to assign numerical category ratings to functional areas. Brunswick received the following ratings (SALP II at 2-3):

Functional Area	Rating
1. Plant Operations	3
2. Refueling Operations	—
3. Maintenance	3
4. Surveillance and Inservice Testing	2
5. Personnel, Training, and Plant Procedures	3
6. Fire Protection and Housekeeping	3
7. Design Changes and Modifications	2
8. Radiation Protection, Radioactive Waste Management, and Transportation	3
9. Environmental Protection	3
10. Emergency Preparedness	2
11. Security and Safeguards	2
12. Audits, Review and Committee Activities	3
13. Administrative, QA, and Records	3
14. Corrective Action and Reporting	2

These ratings represent an average rating of 2.6. In terms of the category definitions stated above, this rating may be equated with a below average, slightly above minimally acceptable, — in a word, mediocre — performance.

The overall facility evaluation for Brunswick was as follows:

During the review period the licensee underwent a reorganization which included major personnel changes. Evaluation of these changes is still in progress although improved performance is expected to result. Major weaknesses were noted in

areas of plant operations, maintenance, fire protection, plant procedures, radiation protection, environmental protection, and quality assurance.

SALP II at 2.

The SALP II analyses for the Robinson and Harris facilities were less extensive. These facilities received ratings of "2" for almost all functional areas. *Id.* at 3-4.

SALP II's "overall utility evaluation" was that the licensee is cooperative with the Commission and displays good technical competence. Weaknesses common to both operating sites were found in the areas of plant operations, procedures, and radiation protection. *Id.* at 2.

CP&L filed extensive comments on the Review Group's Report, contending that that report was not fairly balanced, and taking issue with numerous specific findings and ratings. Addendum 3 to JI Exh. 20. The Regional Administrator reviewed these comments but, in the main, upheld the Review Board's positions. Addendum 4 to JI Exh. 20.

4. SALP III (1982-83)

SALP III found improvement at Brunswick in a few areas, but other problems persisted. Licensee performance was termed "acceptable." SALP III at 3. On the positive side, the report noted that "major strengths were identified in the areas of emergency preparedness and security and safeguards. Positive actions taken during the period were the assignment of a senior manager to the site and development of a long-range improvement plan. Improvements were evident over the previous SALP period in the area of radiological controls." *Id.*

However, on the negative side "major weaknesses were identified in the areas of plant operations, maintenance, surveillance, fire protection, refueling, licensing activities, and quality assurance. Improvements from the previous SALP were not apparent in the areas of plant operations, maintenance, and fire protection." *Id.*

The report expressed the hope that "the long range improvement initiative, which is currently being implemented, is expected to result in improved licensee performance in the weak areas. The licensee has committed a substantial amount of facility and corporate resources to this improvement program." *Id.*

Brunswick's SALP III ratings were as follows:

Functional Area	Rating
1. Plant Operations	3
2. Radiological Controls	2
3. Maintenance	3

Functional Area	Rating
4. Surveillance	3
5. Fire Protection	3
6. Emergency Preparedness	1
7. Security and Safeguards	1
8. Refueling	3
9. Licensing Activities	3
10. Quality Assurance Program	3

These ratings yield an average rating of 2.5, not a significant improvement over SALP II's 2.6 average.

The SALP III ratings of Robinson and Harris were substantially similar to SALP II — i.e., an average of 2.

The "overall utility evaluation" for SALP III was, in part, as follows:

During this appraisal period, the licensee has shown significant improvement in some areas; but several areas, identified during the previous review period as requiring increased management attention, have not shown improvement. The licensee has identified those areas and has initiated extensive long-range improvement programs.

The licensee has exhibited a positive attitude to NRC initiatives; but, in general, licensee responses have demonstrated inadequate management involvement in licensing activities, particularly in the interface with NRR. Levels of performance were consistent with that noted in the previous review period.

Once again, CP&L filed extensive comments on the Review Board's report and, again, the Regional Administration generally upheld the Review Board. See JI Exh. 21, Letter from O'Reilly to Utley dated June 14, 1983.

5. SALP IV (1983-84)

SALP IV found very marked improvement at Brunswick, as reflected in the ratings for functional areas.

Functional Area	Rating
1. Plant Operations	2
2. Radiological Controls	1
3. Maintenance	2
4. Surveillance	2
5. Fire Protection	2
6. Emergency Preparedness	1
7. Security and Safeguards	1
8. Refueling	1
9. Licensing Activities	2
10. Quality Assurance Program	2

The rating for each functional area improved from SALP III, except for Emergency Preparedness and Safeguards, which retained their maximum ratings of "1." The average rating for SALP IV was 1.6, almost a full unit higher than SALP III's 2.5. The SALP IV average of ratings for Robinson and Harris were also improved and were very similar. SALP IV at 4, 8.

The overall evaluation of Brunswick was quite favorable. *Id.* at 5. It spoke of "several major achievements," including implementation of the Brunswick Improvement Plan. No "major weaknesses" were identified. The following comments are particularly relevant here:

The reorganization at Brunswick has resulted in a significant increase in management awareness and control, particularly in the areas of operations and outage management. The effects of assigning a corporate Vice President (VP) to the site became evident during this SALP period, as many problems were handled quickly and effectively with the VP dealing directly with administrative obstacles.

Id. at 6.

Similarly, the SALP IV overall evaluation of CP&L was favorable, including the following endorsement:

During the evaluation period, the increased licensee management attention applied to the entire nuclear organization has changed CP&L from being considered a poor performer during the previous SALP period to a significantly improved utility. The Improvement Program implemented by CP&L has been used as a model by some other Region II utilities to follow in development of their own improvement programs.

Id. at 3.

H. The Joint Intervenor's Approach to the SALP Reports

The preceding description of the SALP Reports casts CP&L in an improving and generally favorable light. The Joint Intervenor asks us to look at various pieces of these same reports from some different angles and to draw less favorable conclusions about CP&L. We consider these Intervenor perspectives next.

In their Proposed Finding 32, Joint Intervenor notes that several areas of weakness in SALP II showed up again as weaknesses in SALP III, notwithstanding Executive Vice President Utley's statements to the effect that CP&L would attempt to make improvements in areas of weakness. Tr. 2968-74. In this same connection, SALP III criticized CP&L for not moving with sufficient vigor in areas cited as weak in the past. Report at 3. We do not believe that, taken in context, the areas of con-

tinuing weakness from SALP II to SALP III are fairly viewed as an indictment of CP&L. Most importantly, *all* the areas of cited weakness were cited as improved (to category 1 or 2) in SALP IV. This trend of gradual improvement supports Mr. Utley's testimony that remedial actions were under way early, but that some would take time. Furthermore, CP&L's extensive comments on SALPs II and III reflect that the SALP criticisms were being taken seriously at the time, even if we assume that CP&L might have taken remedial action more quickly and effectively than it did.

The Joint Intervenors introduced into evidence their Exhibit 39, which "compares selected functional areas for SALP II through SALP IV in those areas where comparisons can be made" They assert that JI Exh. 39 "is helpful in assisting in comparison between the different SALP reports and their evaluations." JI PF 33. However, they do not go on to explain why this exhibit is "helpful." This exhibit might be somewhat helpful if the SALP methodology simply equated numbers of violations with category ratings. As Mr. Bemis made clear, however, violations are only one factor. Tr. 3855. Even under Exhibit 39's violation-counting approach, it generally indicates that higher numbers of violations lead to lower ratings, and vice versa. See, e.g., Robinson: Radiation Controls, Emergency Preparedness, Quality Assurance. Other ratings do not exhibit the same relationship between numbers of violations and ratings. See, e.g., Robinson: Maintenance; Brunswick: Surveillance, Fire Protection. Apparently, other factors were controlling in the latter group of ratings.¹⁴ In any event, we do not think we can draw any useful conclusions from JI Exh. 39.

Joint Intervenors' Exhibit 40 consists of excerpts from a publication entitled *Public Citizen 1983 Nuclear Power Safety Report*. The publication was based upon and included data derived from NRC reports, including SALP II on CP&L's facilities. One apparent purpose of this *Public Citizen* compilation was to compare the sixty-two commercial reactors operating in 1982 in order to show which were "safest" or "least safe," "best" or "worst" in the country. It comes as no surprise that Brunswick fared poorly in that comparison. Thus, among the ten reactors having more than 100 LERs (License Event Reports), Brunswick 1 and 2 ranked 4th and 5th, with 150 and 141 LERs, respectively. In the category of "5 or more incidents with an NRC rating of 2," Brunswick 2 tied for first

¹⁴ Under this management contention, we are not considering the merits of any of the individual ratings. For example, if Brunswick were rated "3" for fire protection, we consider that along with other evidence only to determine CP&L's overall management competence as reflected in the SALP Reports, e.g., whether they take prompt remedial action in response to Staff criticism.

place. (Brunswick 1 also scored high in this dubious distinction category with seven incidents. Forty-three of the sixty-two operating reactors had fewer than five incidents.) Brunswick 1 and 2 exposed 4957 workers to measurable doses of radiation, the highest number by far of any facility in the country. Finally, *Public Citizen* averaged the SALP ratings for Brunswick (as we have done above) and compared them with the averaged ratings of the other sixty operating reactors. Brunswick's average rating for 1982, as we have already seen, was 2.57. Comparatively, Brunswick had the highest (and poorest) average in the country. The next highest average rating went to Arkansas 1 and 2 — 2.45; the lowest and best average ratings went to Yankee Rowe and Haddam Neck, with perfect "1" ratings.¹⁵

Joint Intervenor's Exhibit 40 indicates that Brunswick was a poorly managed facility in 1981. The clear preponderance of the other evidence in this case supports the same conclusion. It may be worth noting that Exhibit 40 casts a somewhat more favorable light on CP&L's contemporaneous performance at Robinson (average rating 2.13) and Shearon Harris (average rating 2). Beyond that, however, Exhibit 40 sheds little or no light on the ultimate issue before us — will CP&L operate Shearon Harris competently in 1986 and thereafter? Most significantly, Exhibit 40, based largely on SALP II, does not reflect the very different results of SALP IV at all.

I. Other Matters

1. Robinson

CP&L's operation of its Robinson 2 facility was not a major focus of separate attention at the hearing and there is little evidence in the record on that subject. As noted above, the SALP Reports on Robinson are generally favorable. The Intervenor's proposed findings on Robinson (JI PFs 71-77), viewed in context, do not lead to any relevant conclusions.

¹⁵ To be sure, the comparative "rankings" of Brunswick and other facilities reflected in Exhibit 40 may not be taken uncritically to demonstrate that Brunswick was then one of the worst managed facilities in the country. For example, as the Applicants point out (APFs 19-20) the number of LERs a facility generates can depend on factors unrelated to safety. In addition, the Applicants and the Staff urge that "SALP ratings cannot be algebraically manipulated to result in an arithmetic mean. Tr. 3655-56 (Bemis)." APF 18. While that may be true in the strict sense, we think that a simple averaging of SALP ratings for a facility in a given year does yield a good rough estimate of how a licensee performed at that facility at that time. Similarly, we think it is legitimate to compare the averages of different facilities.

2. Shearon Harris

Similarly, while certain of the Intervenor's proposed findings on Shearon Harris (JI PFs 78-90) find some support in the record, they say little about the ultimate management issue before us. *See, e.g.*, JI PFs 87-90. The portions of Mr. Maxwell's testimony cited in Proposed Findings 84-86 appear to be the kind of grist one would expect to find in any resident inspector's mill, and not to reflect management failures.¹⁶ The subject of cable tray supports — as discussed in SALP IV and referred to in JI PF 81 — is fairly characterized by the Applicants in their PF 28. On the whole, the SALP IV evaluation of this activity area was favorable. SALP IV at 61-62.

3. Training

The Applicants presented two witnesses, Messrs. Davis and Powell, who testified at some length about the CP&L training program for its nuclear plant personnel. Testimony, ff. Tr. 3399. In their proposed findings, the Joint Intervenor's take exception with only two narrow aspects of the training program. First, they allege that the record evidence is inadequate to determine whether "GET" Levels I and II satisfy regulatory training requirements. JI PF 91. As the Applicants correctly point out, their witnesses, who were well qualified to address the question, testified that Levels I and II *did* satisfy regulatory requirements. Testimony at 9. Tr. 3423-35, 3453-55. There was no evidence to the contrary, except as noted hereafter.

Joint Intervenor's Exhibit 29 is an NRC Information Notice entitled "Deliberate Circumventing of Station Health Physics Procedures." The Intervenor's point to it as proof that the CP&L GET Level I or II Training received by contractor personnel is not adequate. JI PF 92. We agree with the main thrust of the Applicants' Reply Finding 32, as follows:

An investigation of the incident at Brunswick, which involved two contract personnel allegedly swapping dosimeters, revealed no evidence that there was a widespread practice of any duration. There is no evidence that this incident at Brunswick was the result of inadequate training.

¹⁶ The Intervenor's cite Mr. Maxwell's testimony that he has been a resident inspector at Shearon Harris since 1980, and that he was employed by CP&L as a quality assurance technician at Brunswick in 1973-74. Tr. 3816-17. The Board implies no personal criticism of Mr. Maxwell in questioning the wisdom of assigning a former employee to police activities at the former employer's site.

J. Conclusion

Generalizing largely from the Brunswick experience to CP&L's overall nuclear program, including Harris, Mr. Bemis expressed confidence in CP&L's managerial ability and commitment to safety. He testified that:

At the time of my assignment my impression about the management at all levels of the CP&L structure was that they were not being kept informed as to what was occurring at the nuclear facilities, that they were only interested in meeting the minimum requirements, and that they did not understand the difference in operating a nuclear facility with its many different rules and regulations for protection of the public health and safety and operating a fossil facility. We in nuclear regulation call this "fossil mentality" The development of the Brunswick Improvement Program in 1982 and the issuance of the civil penalty for the breakdown in management controls was where I feel that CP&L's genesis of a "nuclear mentality" took place. From the summer of 1982 to present I found strong dedication from all CP&L management not only to meet the NRC regulations, but to exceed our requirements when possible. . . . I found management open minded about preventative enforcement. By this I mean they would envelop areas that the resident inspectors and I would see as having potential enforcement concerns and implement immediate corrective measures in these areas prior to NRC being required to institute enforcement actions.

Mr. Bemis summarized his conclusions and the NRC Staff's position as follows:

The staff concludes CP&L is technically qualified to operate the Harris facility within the purview of the regulations and with due regard for public health and safety. The Region II inspection and enforcement program will be applied to assure the CP&L continues to operate within the regulations and continues to make improvements in the nuclear program.

The Board basically agrees with this Staff assessment. As we stated previously, we have high confidence in Mr. Bemis, based on his technical expertise and extensive experience with CP&L. Moreover, the Staff's assessment at the hearing, as expressed by Mr. Bemis, is consistent with the SALP Reports. The Joint Intervenor's rather miscellaneous collection of evidence unfavorable to CP&L largely derives from events occurring in 1982 and earlier. This evidence has been superseded (substantially, if not entirely) by a sustained period of improved CP&L management performance since that time. The Applicants, supported by the NRC Staff, have effectively refuted Joint Contention I.

III. THERMOLUMINESCENT DOSIMETERS

A. Introduction

1. A thermoluminescent dosimeter (TLD) is a device used for measuring exposure to radiation. When a TLD is irradiated by ionizing radiation, some energy is absorbed and stored. If the TLD subsequently is heated, some of the stored energy is released as light which can be detected and measured. The quantity of light released is proportional to the dose received by the individual wearing the TLD. (Browne, ff. Tr. 6407, at 3.)

2. Joint Contention IV concerning Applicants' use of thermoluminescent dosimeters originally consisted of four claims: (1) TLDs are inaccurate; (2) TLDs lack real-time monitoring capability; (3) TLDs are inadequate to assure worker health and safety; and (4) pressurized ionization monitors are necessary to protect worker health and safety. Applicants moved for summary disposition and the NRC Staff supported the motion. Summary disposition was granted on three of the issues. The Board found that other instruments provide real-time monitoring capability; that TLDs used in conjunction with the totality of the radiation protection program are not inadequate and that pressurized ionization monitors are not necessary. The sole issue litigated was "whether the TLDs and measuring equipment and processes to be used at the Harris facility can measure occupational doses with sufficient accuracy to comply with the NRC regulations." (Memorandum and Order Ruling on Motions for Summary Disposition, April 13, 1984 (unpublished), and Tr. 2218 for Telephone Conference of August 10, 1984.)

3. Mr. Stephen A. Browne, who currently is responsible for the technical direction of personnel dosimetry programs at all CP&L nuclear plants, testified for the Applicants. (Browne, ff. Tr. 6407, at 1.) Mr. John P. Cusimano, Mr. Seymour Block and Mr. Ross Albright testified on behalf of the NRC Staff. Mr. Cusimano is employed by the U.S. Department of Energy, Radiological and Environmental Sciences Laboratory, as a Senior Physicist in the Dosimetry branch. Mr. Block is employed by the NRC as a Senior Health Physicist and is responsible for reviewing Applicants' radiation protection programs. (Cusimano/Block, ff. Tr. 6560, at 1-2.) Mr. Albright is a Radiation Specialist with NRC Region II. His responsibilities include the inspection of the radiation protection and radioactive materials transportation programs at various licensed facilities in Region II. (Albright, ff. Tr. 6567, at 1.)

4. At the request of the Board, the Staff also presented Dr. Phillip Plato as a witness in this proceeding. Dr. Plato is a Professor of Radiological Health at the University of Michigan. Dr. Plato was a member of the

Health Physics Society Working Group which wrote draft standard ANSI N13.11. He is also the contractor who conducted the pilot studies involving both versions of this draft standard. (Plato, Tr. 6562.) Dr. Plato adopted and agreed with the Staff's testimony of Messrs. Cusimano and Block to the extent that it described the third pilot study. (*Id.*)

5. Joint Intervenor did not contribute any testimony on this contention.

B. Background

6. NRC regulations do not contain an explicit standard for accuracy in measurements of radiation doses to workers. In 1975, the Health Physics Society Standards Committee formed Working Group 1.4 to prepare a standard that could be used to test the performance of organizations that provide personnel dosimetry processing for radiation workers. The Standard was issued for trial use by the American National Standards Institute as ANSI N13.11 in 1976. At this same time, the NRC announced its intention to amend 10 C.F.R. Part 20 to require that NRC licensees obtain personnel dosimetry from a processor that had passed the ANSI standard. The NRC held a public meeting to discuss this potential amendment to Part 20 [and other Government agencies expressed similar intentions]. The attendees at the NRC's public meeting requested that, before a mandatory testing program were initiated, a pilot study should be conducted which would use the ANSI standard. In 1977, the University of Michigan was awarded an NRC contract to provide two tests to dosimetry processors that chose to participate voluntarily.

The results from Tests #1 and #2 were reviewed by the Health Physics Society Standards Committee and formed the basis for revision of the Standard in 1981. Subsequently, the revised Standard was used in Test #3 conducted by the University of Michigan during 1981-82. (NUREG/CR-2891, "Performance Testing of Personnel Dosimetry Services," February 1983.)

The revised Standard was adopted by ANSI and published as ANSI Standard N13.11-1983. Further, the NRC has issued a proposed rule under Part 20 titled "Improved Personnel Dosimetry Processing" (49 Fed. Reg. 1205-11 (Jan. 10, 1984)) that includes the ANSI N13.11-1983 Standard as part of the evaluation of dosimetry processors. The Summary in the Proposed Rule states:

Tests have indicated that a significant percentage of personnel dosimetry processors may not be performing with a reasonable degree of accuracy. Current regulations do not address the competency of these processors. The NRC is proposing amendments

that would require its licensees to utilize the specified services of processors that have been accredited by the National Voluntary Laboratory Accreditation Program (NAVLP) of the National Bureau of Standards.

This nationwide and decade-long concern with dosimetry inaccuracy formed much of the basis for the Joint Intervenors' allegations in this proceeding.

C. The ANSI Standard¹⁷

7. The ANSI standard is formulated in terms of tolerance limits, L , as a pass/fail criterion. The performance index for a single dosimeter, P , is calculated as:

$$P = (H' - H)/H$$

where:

H = delivered quantity

H' = reported quantity

For each radiation category, the average performance index, \bar{P} , and the standard deviation, S , are calculated. These two statistics are combined in the ANSI formulation of the pass/fail criterion. A processor passes a category if

$$\bar{P} + S \leq L$$

where:

$L = 0.5$ (doses below 10 rem)

$L = 0.3$ (doses above 10 rem)

This formulation of the tolerance limit is less stringent than the original formulation in the draft ANSI standard, which was $\bar{P} + 2S \leq L$. The Health Physics Society Standards Committee recognized that the revised formulation was weaker than the recommendations of international authorities in the field of radiation protection.¹⁸

¹⁷ As the Board saw it, we were not directly litigating the adequacy of the ANSI Standard, which, as we have noted, is the subject of a pending rulemaking. See *Duke Power Co. (Catawba Nuclear Station, Units 1 and 2)*, ALAB-813, 22 NRC 59, 85 (1985). Rather the litigation focused on whether the Applicants' dosimetry was sufficiently accurate to meet existing NRC accuracy standards. As the record developed, however, the two subjects were to some extent necessarily intertwined.

¹⁸ The rationale for the tolerance level is described in ANSI N13.11-1983 in Appendix D3 to the standard in the following words:

Choice of Tolerance Level, L

The values chosen for the tolerance level represent a compromise between the recommendations of international authorities in the field of radiation protection and radiation measurements, and

(Continued)

8. As Applicants' witness Browne testified, a recent publication¹⁹ of the International Commission on Radiation Protection (ICRP) states the following concerning the measurement of dose equivalent:

If these quantities are of the order of the relevant annual limits, the uncertainties should not exceed a factor of 1.5 at the 95% confidence level. Where they amount to less than 10 mSv [1 rem] an uncertainty of a factor of 2 at the 95% confidence level is acceptable.

(Browne, ff. Tr. 6407, at 6.)

The Board finds, in agreement with Mr. Browne, that the ICRP 35 recommendation can be expressed in mathematical terms as: $\bar{P} + 2S \leq 0.5$, for doses of approximately 5 rem (the annual limit). (*Id.* at 10, 11.) The weaker ANSI standard appears to be questionable when viewed against the ICRP recommendation.

9. In our April 13, 1984 Memorandum and Order, the Board took the position that the NRC regulations require that personnel dosimetry be carried out in a manner such that the results can be relied upon to be accurate to integer values or one significant figure for doses of a few rem. Regulatory compliance is not compatible with the acceptance of performance with a standard deviation of 50%. A conventional interpretation of the 50% standard deviation would be that, at the 95% confidence level, an individual dose estimate would be uncertain by 2 standard deviations amounting to 100%. An observed dose, for example, of 2 rem in 1 calendar quarter could not be viewed, *with reasonable confidence*, as meeting the regulatory 3-rem quarterly limit because the uncertainty would range from 0 to 4 rem by the ANSI standard. We find the

the limitations dictated by available measurement techniques. In ICRU Report 20 [E20] and NCRP Report 57 [E42], a 30-percent limit is recommended for the uncertainty in the interpretation of the dose equivalent (or absorbed dose) in the vicinity of the maximum permissible levels, although an uncertainty of as much as a factor of three is considered acceptable at levels smaller by an order of magnitude. In ICRP Report 12 [E43], on the other hand, a limit of 50 percent is recommended in the vicinity of maximum permissible levels under field conditions, when errors caused by unknown irradiation geometry or ambient conditions are taken into account. For dose interpretations at accident levels, a tolerance level of 20 percent is recommended in NCRP Report 57 [E44].

In this standard, a fixed irradiation geometry and fixed laboratory ambient conditions are specified for the test irradiations. Because of limitations in measurement technique, the tolerance level is set at 0.5 (50 percent) for all but the accident categories, where it is set at 0.3 (30 percent). Larger tolerance levels for dose equivalents well below the maximum permissible dose equivalent were considered and, in fact, had been incorporated in the first version of this standard. Subsequent to the experience gained in the pilot testing program referred to in the Foreword, this feature was deleted since for the tests specified in this standard (calling for irradiation in relatively straightforward radiation fields under ideal laboratory conditions and analysis of performance based on the average performance quotient obtained over a large range of dose equivalents), relaxation of the tolerance levels was found to be unnecessary.

¹⁹ "General Principles of Monitoring for Radiation Protection of Workers," ICRP Publ. No. 35 (1982), at 25.

ICRP recommendation to be compatible with our reading of the NRC regulatory requirement and, thus, from both points of view, we review the Applicants' TLD program to see if these performance qualities will be achieved.

D. CP&L Performance in Dosimetry Tests

10. The Applicants propose to use Panasonic Model UD-802 AQ TLDs at the Harris plant. These TLDs were used by CP&L in the performance testing carried out by Dr. Plato at the University of Michigan. (browne, ff. Tr. 6407, at 10.) The results of the testing were summarized as follows:

Category	Radiation Type	1982 CP&L Performance (P + S)	1984 CP&L Performance (P + S)	ANSI Limit
I	X-ray Accident	0.24	0.18	0.3
II	Gamma Accident	0.10	0.15	0.3
III	X-ray Shallow	0.11	0.18	0.5
	X-ray Deep	0.12	0.16	0.5
IV	Gamma	0.06	0.10	0.5
V	Beta	0.30	0.28	0.5
VI	Gamma & X-ray Shallow	0.06	0.19	0.5
	Gamma & X-ray Deep	0.16	0.18	0.5
VII	Gamma & Beta Shallow	0.16	0.29	0.5
	Gamma & Beta Deep	0.11	0.10	0.5
VIII	Gamma & Neutron	*	0.09	0.5

*CP&L did not participate in this test category in 1982.

The Board finds that the CP&L performance in all eight radiation categories met the ANSI tolerance limits with fairly comfortable margins. Further, the Applicants testified that the test results would be acceptable even if the more stringent tolerance formulation of ICRP 35 or the original 1976 ANSI standard were used, as shown in the following tabulation.

Category	Radiation Type	1982 CP&L Performance ($P + 2S$)	1984 CP&L Performance ($P + 2S$)	1976 ANSI Limit
I	X-ray Accident	0.37	0.29	0.3
II	Gamma Accident	0.14	0.21	0.3
III	X-ray Shallow	0.16	0.26	0.3
	X-ray Deep	0.22	0.25	0.3
IV	Gamma	0.09	0.17	0.3
V	Beta	0.36	0.37	0.3
VI	Gamma & X-ray Shallow	0.12	0.26	0.3
	Gamma & X-ray Deep	0.23	0.28	0.3
VII	Gamma & Beta Shallow	0.22	0.41	0.5
	Gamma & Beta Deep	0.17	0.18	0.5
VIII	Gamma & Neutron Deep	*	0.15	0.5

*CP&L did not participate in this test category in 1982.

(Browne, ff. Tr. 6407, at 10.)

11. Applicants' witness noted the exceedance in the results for the accident x-ray category in 1982 and took the view that it is not realistic to expect that an individual could receive accident-level exposures to x-rays in a nuclear power plant. We agree and, further, the improved 1984 results in this category lead us to give little weight to this one exceedance.

12. The Board finds these test results provide an unusually clear and unequivocal line of evidence that refutes the allegation of dosimetry inaccuracies in this contention, and demonstrates compliance with NRC regulations.

E. Applicants' Quality Control for TLDs

13. Test results may be questioned in terms of whether unusual care was exercised during the tests, so that the results might not be representative of the accuracy achieved during routine personnel dosimetry. Consistent accuracy will be dependent on the existence of an appropriate quality control program.

14. NUREG/CR-2891, the report of the results of the 1982 Pilot study, noted the existence of four common reasons for poor performance of dosimetry processors. These were: (1) use of incorrect calibration factors; (2) dosimeter variability; (3) clerical errors; and (4) poor calibration for accident doses. CP&L has taken steps to minimize errors in each of these four areas through an extensive quality assurance program. (*Id.* at 20-21.)

15. Calibration factors have been determined for the Applicants' TLD system based on irradiation of TLDs to NBS traceable radiation standards. These correction factors have been verified by the tests conducted in 1982 and 1984, and will also be verified by the quarterly inter-comparison program engaged in by Applicants with the University of Michigan. (*Id.* at 21.) This program follows the format of the ANSI performance test, except that CP&L has added two additional radiation categories which are applicable to the radiation types and energies found in its nuclear plants, and has dropped the accident categories which differ from other categories only in the dose level. These two added categories are low-energy beta and mixtures of low-energy beta with high-energy photons. (*Id.* at 12-13.) A monthly cross-check program is conducted where a number of TLDs are read on each TLD reader with a 0.3 accuracy standard. Each reader is calibrated semiannually and after any maintenance affecting calibration. (*Id.*) The TLD readers also undergo a daily quality assurance check which requires a 15% standard of accuracy for critical parameters. (*Id.*)

16. In the semiannual calibration of the readers, ten TLDs are read at five exposure levels from 0.25 to 4.0 rem. They must be within 10% of the known dose, and the standard deviation must not exceed 10%. For daily TLD reader calibration checks, TLDs are read after being irradiated to known doses of 0.5 and 4.0 rem. Each TLD must read within $\pm 15\%$ of the actual irradiated dose. If a reading within $\pm 15\%$ is not obtained, the check is repeated two more times; if the check fails two out of three times, the TLD is removed from service. (*Id.* at 22.)

17. Dosimeter variability is minimized by carrying out an initial acceptance test of TLDs received from the manufacturer. Each TLD in a batch of 500 must be accurate to within $\pm 15\%$. The same test procedure is performed semiannually to determine whether any TLDs should be removed from service. *Id.* at 23.

18. In order to eliminate the potential for clerical error, CP&L has installed an automatic data processing system with detailed verification techniques. Individual records are on a computer which interfaces with the TLD reader. Where a manual entry is required it is verified by other

people, and hard copies of records are maintained to back up the computer. (*Id.*)

19. With regard to poor calibration for accident doses, CP&L has performed in-house tests which establish the dose response of the TLDs up to doses of 100 rem. The response is essentially linear within approximately $\pm 15\%$. In addition, CP&L has participated in and passed the accident dose categories during ANSI performance tests in 1982 and 1984. This verifies that poor calibration for accident doses is not a problem at CP&L. (*Id.* at 24.)

20. During cross-examination of Applicants' witness, Intervenor raised the issue of whether the effects of fading are considered in the reading of TLDs. (Browne, Tr. 6440.) Applicants' witness indicated that their procedures consider fading and that most fading of the stored signal on the TLD occurs within a relatively short time period after exposure. (*Id.*) It is Applicants' opinion that fading is contingent on temperature, and that at the temperatures experienced in a nuclear power plant, fading is not a significant problem. (*Id.*, Tr. 6441.)

21. The effects of fading also depend on the way the TLD reader is calibrated. (*Id.*, Tr. 6442.) Applicants allow the badges used to calibrate their readers to fade for 24 hours before they calibrate their system, so that most fading has occurred. (*Id.*) The fading of the TLD which occurs between the first and 30th day after exposure is relatively small, less than 10%. (*Id.*, Tr. 6442-43.) Applicants' witness testified that the elements in the TLD, which are sensitive to light, are always protected to prevent fading from light. (*Id.*)

22. It is the Staff's position that the Panasonic System has been found to provide reliable and accurate information. (Cusimano, Tr. 6568.) In addition, inspections of the Applicants' dosimetry program indicate that they have quality control programs for dosimetry equipment. Such inspections also indicate that the TLD program is adequate to protect the health and safety of the Applicants' workers. (Albright, Tr. 6569-70.) Finally, it is the Staff's position that the results of the third pilot study conducted by the University of Michigan indicate that Applicants have the capability to perform good-quality dosimetry processing. (Cusimano/Block, ff. Tr. 6560, at 8.) Therefore, Applicants' personnel monitoring program is adequate, in the Staff view, to protect the health and safety of the workers and complies with 10 C.F.R. § 20.202(a) of the Commission's Regulations. (*Id.*)

23. The Board finds that the CP&L quality assurance program for TLD personnel dosimetry appropriately controls the sources of errors that have plagued other dosimeter processors. Although CP&L's self-imposed accuracy requirements are more stringent than the ANSI stand-

ard, CP&L has no intention of relaxing its own in-house standards if the ANSI standard is adopted by the NRC as part of a final rule for accrediting dosimetry processors (Browne, Tr. 6536.) We concur with Staff that the program is adequate and go further to the view that indeed we think the program is commendable.

24. Joint Intervenor's proposed findings basically comport with the record as we have described it. However, their Proposed Finding 12 urges the Board to require Applicants to have written procedures for the performance of all routine dosimetry operations, formal training and qualification of all operating personnel and supervisory review of all quality control records. This suggestion has no merit since Applicants have testified that their program already contains these features (Browne, ff. Tr. 6407, at 24, 28), and the NRC Staff has confirmed their existence and functioning during recent inspections. (Albright, ff. Tr. 6567.)

25. Joint Intervenor's advocate, in their Proposed Findings 13 and 14, that Applicants should be required to compensate for possible inaccuracy in TLD measurements by limiting worker exposure to two-thirds of the regulatory limit. Such an exotic modification to the regulations is beyond our authority. As the NRC Staff points out in reply, if the Intervenor's wish to challenge the regulatory limits, then their remedy would have been to show "special circumstances" pursuant to 10 C.F.R. § 2.758.

26. The results of the testing by the University of Michigan and the Applicants' quality assurance program for personnel dosimetry using TLDs provide clear and uncontroverted evidence that resolves this contention in favor of the Applicants.

IV. ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

A. Introduction

1. Contention 9 as litigated in this proceeding states:

The Program for environmental qualification of electrical equipment at Shearon Harris is inadequate for the following reasons: (A) the proposed resolution and vendors modification for ITT-Barton transmitters has not been shown to be adequate. (Ref. IE Information Notices 81-29, 82-52, and 83-72.) (B) There is not sufficient assurance that the concerns with Limitorque valve operators identified in IE Information Notice 83-72 (except for items C2, C5 and C7) have been adequately resolved. (C) It has not been demonstrated that the RTDs have been qualified in that the Arrhenius thermal aging methodology employed is not adequate to reflect

the actual effects of exposures to temperatures of normal operation and accidents over the times the RTDs could be exposed to those temperatures. (Ref. NUREG/CR-1466, SAND-79-1561, Predicting Life Expectancy of Complex Equipment Using Accelerated Aging Techniques.) (D) The qualification of instrument cables did not include adequate consideration and analysis of leakage currents resulting from the radiation environment. These leakage currents could cause degradation of signal quality and/or spurious signals in Harris instrument cables. (E) There is not sufficient assurance that the physical orientation of equipment in testing is the same as the physical orientation of equipment installed. (F) The effects of radiation on lubricants and seals has not been adequately addressed in the environmental qualification program. (G) There is inadequate assurance that failure to report all results of environmental qualification tests, including failures, has been brought to light in connection with electrical equipment installed at Harris. This includes past test failures of equipment which subsequently passes an EQ test and test failures of equipment which is said to be qualified by similarity. (REF. Item 2, Page 5, L.D. Bustard et al., Annual Report - Equipment Qualification Inspection Program, Sandia National Laboratories, FY83)

2. Eddleman Contention 9 was originally admitted by the Board in September of 1982. LBP-82-119A, *supra*, 16 NRC at 2091. The contention was modified to read, as stated above, by negotiations between Applicants and Intervenor Eddleman. This modification was accepted by the Board in July of 1984. "Memorandum and Order (Revision of and Schedule for Filing Written Testimony on Eddleman Contention 9; Rulings on Eddleman Contentions 45 and 67) (July 24, 1984)."

3. Intervenor presented no direct evidence on this contention.

4. The Staff presented the testimony of Armando Masciantonio with respect to each of the seven subparts of this contention. Mr. Masciantonio is employed as an Equipment Qualification Engineer, Division of Engineering, Office of Nuclear Reactor Regulation. He is responsible for the technical reviews, analyses and evaluations of the adequacy of the environmental qualification of electrical equipment important to safety, and safety-related mechanical equipment whose failure under postulated environmental conditions could adversely affect the performance of safety systems in nuclear power plants. Masciantonio, ff. Tr. 5567, Attach. I. Mr. Masciantonio is directly responsible for the review of the Shearon Harris Environmental Qualification Program. Masciantonio, Tr. 5608.

5. The Applicants presented the testimony of various panels concerning different subparts of the contention and those panels are identified *infra* in the findings for the specific subcontentions. In addition, Applicants' panel, consisting of Mr. Robert W. Prunty and Peter M. Yandow, provided for informational purposes introductory testimony which described briefly Applicants' program for environmental qualification of electrical equipment ("EQ Program"). (Mr. Masciantonio's tes-

timony also included general discussion of Applicants' EQ Program.) Mr. Prunty is employed by CP&L as a Principal Engineer in the Electrical Group and Instrumentation and Control Group at Harris. He is responsible for the EQ Program in a supervisory capacity. Mr. Yandow is employed by CP&L as a Senior Engineer in the Instrumentation and Control Group and is responsible for the detailed aspects of the EQ Program, ff. Tr. 4971, at 2.

6. The purpose of the EQ Program at the SHNPP is to ensure all safety-related electrical equipment and other electrical equipment important to safety is capable of performing its safety functions in the environment postulated for design basis events. Environmental conditions include temperature, pressure, humidity, radiation, chemical spray and submergence. Applicants' Introductory Testimony at 9; Masciantonio at 3-5.

7. The Commission's regulations at 10 C.F.R. § 50.49 establish requirements for environmental qualification of electrical equipment important to safety. Equipment "important to safety" includes safety-related electrical equipment, nonsafety-related electrical equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by safety-related equipment, and certain post-accident monitoring equipment. In general, environmental qualification is required to meet General Design Criteria 1, 2, 4 and 23 of Appendix A, and §§ III and XI of Appendix B, to 10 C.F.R. Part 50. Staff guidance for meeting the regulatory requirements in 10 C.F.R. § 50.49 is provided in NUREG-0588 (Rev. 1), "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," July 1981. Applicants' Introductory Testimony at 9-10; Masciantonio at 3-5.

8. Applicants' Environmental Qualification Program is contained in § 3.11 of the FSAR. FSAR Appendix 3.11A compares Applicants' procedures for environmental qualification of electrical equipment with NUREG-0588. Prunty/Yandow, ff. Tr. 4971, at 10. The Staff's review of Applicants' submittals is in the early stages. Masciantonio, Tr. 5601.

9. However, Applicants submitted letters on July 25 and August 24, 1984, indicating how the specific concerns raised by Contention 9 were being resolved in their Environmental Qualification Program. Masciantonio, ff. Tr. 5567, at 7. The Staff has reviewed the information provided by the Applicants to determine the adequacy of the Environmental Qualification Program in addressing each of the issues raised in this contention. *Id.* The Staff also made a site visit to verify the accuracy of the information submitted by Applicants. *Id.* at 8.

10. Intervenor Eddleman points out in his Proposed Finding 30 that the NRC Staff requested additional information after the hearing on the Harris EQ Program (transmittal December 5, 1984), and Mr. Eddleman takes the position that this request for information "undermines all assertions that the Harris EQ Program is adequate." Mr. Eddleman has ignored Applicant and Staff testimony that only the specific concerns in this contention had been reviewed at the time of the hearing. We do not find any merit in this proposed finding.

B. Contention 9A: ITT-Barton Transmitters

11. Testimony for the Applicants on this contention was presented by Peter M. Yandow, Robert W. Prunty and Richard B. Miller. Mr. Yandow is employed by CP&L as an Electrical Engineer and is currently responsible for the Environmental Qualification Program at Harris. Mr. Prunty is employed by CP&L as a Principal Engineer in the Electrical and Instrumentation and Control ("I&C") areas, and he established the EQ Program for the Harris plant. Mr. Miller is employed as a Principal Engineer with the Nuclear Safety Department of Westinghouse Electric Corporation. Mr. Miller is a co-author of WCAP-8587, which describes Westinghouse's methodology for qualifying electrical equipment. Mr. Miller was active in the performance of safety evaluations concerning the problems noted with ITT-Barton Transmitters. Prunty *et al.*, ff. Tr. 5093, at 2-3.

12. ITT-Barton Transmitters are pressure-type transmitters. They use either a bourdon tube or bellows assembly to measure pressure and differential pressure, respectively. Pressure changes cause the mechanical movement of strain gages. The variation in tension causes changes in electrical resistance of the strain gages, which is converted into an electrical output by the electronic circuitry of the transmitters. *Id.* at 4.

13. At Harris, both models 763 and 764 ITT-Barton Transmitters are used for various safety functions such as to check reactor coolant pressure, pressurizer pressure, steam pressure, pressurizer level, steam generator level, and steam flow. Such transmitters are located throughout the containment building. *Id.* at 6.

14. Both Applicants and Staff testified that three deficiencies with ITT-Barton Transmitters were noted by Information Notices 81-29, 82-52 and 83-72. *Id.* at 5; Masciantonio, ff. Tr. 5567, at 8-10.

15. The first defect consisted of failure of initial qualification tests due to erratic behavior. The significance of the failure was an error in output which could have resulted in the safety analysis limits being exceeded. Prunty *et al.*, ff. Tr. 5093, at 5. The failure was determined to

result from degradation of contacts in internal circuit connector assemblies of the transmitters. *Id.* This problem was corrected by the soldering of connector assemblies. *Id.* The modification and test results were reported to the Staff and approved by the Staff on November 10, 1983. *Id.* at 6; Masciantonio, ff. Tr. 5567, at 8.

16. Applicants returned the affected models of ITT-Barton Transmitters to ITT-Barton for performance of the above-described modifications. Applicants have received test reports to confirm that the modification is adequate to qualify the equipment. Prunty *et al.*, ff. Tr. 5093, at 7.

17. The two additional problems with ITT-Barton Transmitters concern the negative shift which is a decrease in output during initial exposure to constant operating pressure, and thermal nonrepeatability of both models 763 and 764 ITT-Barton Transmitters. *Id.* at 7-8; Masciantonio, ff. Tr. 5567, at 8-9. Thermal nonrepeatability is the inability of the instrument to repeat a specified output within allowable limits when exposed to the same temperature and pressure to which it was initially calibrated. Prunty *et al.*, ff. Tr. 5093, at 8.

18. The cause of the negative shift problem was determined to be combined creep in the link wire between the pressure bourdon tube and the strain-sensing beam, and in the material used to attach the link wire. *Id.* This negative shift problem was determined not to have any safety significance. *Id.* The effect of negative shift on the over-temperature delta T is minimal and in the conservative direction. Also, the effect of such negative shift on low-pressure trip is conservative. There is no modification presently proposed for this problem. *Id.* at 9.

19. Westinghouse's conclusions regarding the safety significance of the negative shift problem are contained in an analysis performed by Westinghouse. This analysis was first presented to the Staff in a meeting during February of 1984. Miller, Tr. 5095-98.

20. At the time of the hearings, the Staff had not completed its review of this Westinghouse analysis. Masciantonio, ff. Tr. 5567, at 9; Masciantonio, Tr. 5634. The Staff testified, however, that there is no indication that such analysis is inadequate. Masciantonio, Tr. 5635.

21. During the hearing, Staff Counsel informed the Board that the review of the Westinghouse analysis relating to ITT-Barton Transmitters could be accelerated and that this review would be completed shortly. Tr. 5692. This review was completed and the Staff submitted the Affidavit of Armando S. Masciantonio, Richard A. Kendall and Robert C. Jones, Jr., along with a Motion to Supplement the Record to receive the Affidavit. "NRC Staff Motion to Supplement the Record" (November 20, 1984). During the hearing, Mr. Eddleman indicated he had no desire to cross-examine Staff witnesses on the results of their review,

and had no objection to the submission of a supplemental Staff Affidavit setting forth those results. However, he wished it to be understood he did not necessarily agree with the Affidavit. Eddleman, Tr. 5770-71. On December 17, 1984, the Board admitted the Staff's Affidavit which sets forth the results of its review of the Westinghouse analysis as NRC Staff Exhibit 7. Tr. 7413, 7432.

22. With respect to the negative shift problem, the Staff concluded that the additional error introduced by the negative shift does not cause a safety concern. The Staff's review indicates that the maximum additional error due to the negative shift in the transmitter output was calculated based on actual long-term test data. This maximum transmitter error was included in the calculation of the total actuation system channel error and was used in the Safety Analysis Limit previously reviewed and approved by the Staff. The Safety Analysis Limit for the high pressurizer pressure reactor trip has been increased from 2440 psig to 2445 psig. The Staff has determined that this revised value will provide adequate protection for the RCS overpressurization events and limit the peak RCS pressure to less than 110% of the design value. This is consistent with §§ 15.2.1-15.2.5 of the Standard Review Plan. Staff Exh. 7, ¶ 7.

23. With regard to thermal nonrepeatability, the sources of the errors were discovered to be improper calibration techniques used by Barton. The resultant error would always be in the positive direction. Barton also found an electrical leakage path through the wiper arm of the zero and span potentiometers to the instrument cases. The path only creates positive errors at high temperatures and is only of concern during accident conditions. Prunty *et al.*, ff. Tr. 5093, at 9-10. Westinghouse calculated the expected deviations due to this error, and evaluated the effects of the deviations on transmitter function. Westinghouse changed the set points at Harris to provide an adequate margin between the Safety Analysis Limits and the set points so that there would be no safety concern. *Id.* at 10-11.

24. As corrective actions, the correct calibration techniques were used to check the transmitters. Also, a fiberglass insulator was installed between the potentiometer and the case to interrupt the leakage path. *Id.* at 11. Any transmitter returned to the factory for other repairs would also have the above modifications performed. *Id.*

25. With regard to thermal nonrepeatability, the Staff's affidavit indicated that their review of test results for modified units demonstrates that the proposed resolution of this defect is adequate. Staff Exh. 7, ¶ 6.

26. During cross-examination, Applicants' witness testified that another report of a negative shift problem on the zero-based pressure

transmitters manufactured by ITT-Barton has also been observed. Some of these transmitters are used in Harris. The nature of this negative shift is the same as that discussed in Applicants' testimony. Miller, Tr. 5102. The effect on the Barton transmitter is less, according to Applicants' witness, in magnitude than on the other suppressed zero model. *Id.*, Tr. 5103.

27. Applicants' witness testified that there is a $\pm 1\%$ shift allowance for Barton transmitters. The negative shift discovered on the zero-based transmitter is within the $\pm 1\%$. *Id.*

28. Applicants' witnesses testified that all of the ITT-Barton transmitters were qualified by test rather than by similarity. Miller, Tr. 5113. Applicants also indicated that the potential safety significance of thermal nonrepeatability is somewhat mitigated because the establishment of a set point is not at the point where there would be a safety concern. These set points are backed off from safety limits so that an instrument could exceed the set point and stay within safety limits. Yandow, Tr. 5121. The margin between the set point and the safety limit accounts for all instrument errors. This margin is on the order of 10 to 15%. Miller, Tr. 5122. Applicants indicated that upon receipt from Barton of the transmitters previously returned to the factory they would be inspected by Applicants' QA Program. Prunty, Tr. 5133.

29. On cross-examination Applicants stated that Westinghouse has now approved Barton's calibration procedures, and that Westinghouse's QA organization will actually check as to how the procedures are performed. Miller, Tr. 5160.

30. In light of the modifications being made to correct the thermal nonrepeatability and connector problems, and in light of the results of the Westinghouse analysis dealing with thermal nonrepeatability and negative shift problems, both Applicants and Staff have concluded that the Harris Environmental Qualification Program adequately addresses all of the concerns with the ITT-Barton Transmitters. Prunty *et al.*, ff. Tr. 5093, at 12; Masciantonio, ff. Tr. 5567, at 8-10; Staff Exh. 7, ¶ 8.

31. The Board finds that Applicants' Environmental Qualification Program has adequately addressed concerns relating to ITT-Barton transmitters. The Board also finds that the proposed vendor modifications of the ITT-Barton transmitters are acceptable.

C. Contention 9B: Limitorque Valve Operators

32. For Contention 9B, Applicants' panel was composed of Mr. Prunty and Mr. Yandow, who are identified *supra*.

33. A valve operator is a component of a valve which causes it to open or close. These valve operators have motors which cause the valve to change position. They are used in valves such as globe valves, butterfly valves, and gate valves. Limitorque valve operators are used on a number of valves at Harris which perform safety functions, including containment isolation, reactor coolant pressure boundary isolation, ECCS operation, and operation of the emergency safeguard system. These valve operators are located both inside containment and in the auxiliary building. Prunty/Yandow 9B, ff. Tr. 4971, at 3.

34. Applicants testified that Limitorque determined that only one of a number of deficiencies noted in IE Information Notice 83-72 pertaining to Limitorque valve operators was applicable to Harris. That deficiency concerned the use of unqualified terminal blocks in some Limitorque valve operators supplied to Westinghouse. Applicants testified that Limitorque indicated that Westinghouse had undertaken to replace all unqualified terminal blocks. *Id.* at 5. In addition, however, Applicants have committed to do a 100% field verification of all Limitorque valve operators on active valves in harsh environments. Yandow, Tr. 4975-77; Prunty/Yandow 9B, ff. Tr. 4971, at 5.

35. Applicants testified that an active valve is one which actually must move to perform its function. Yandow, Tr. 5029. It is Applicants' position that the function of a passive valve would not have safety significance if it failed. Yandow, Tr. 5030.

36. The inspection is being performed in three phases. The first phase — the inspection of all active safety-related valves inside containment — has found no deficiencies. The second phase involved inspection of all active valves in the steam tunnel; no deficiencies were found. All of the remaining safety-related active valves in a harsh environment were yet to be inspected at the time of hearing. Yandow, Tr. 4975.

37. A concern was also raised about the motor insulation used in Limitorque valve operators. Prunty/Yandow 9B, ff. Tr. 4971, at 8. Bechtel had raised a concern about the use of a class of insulation which had not been type-tested for inside containment. As part of the field verification program, Applicants are checking the name plates to determine that the insulation is correct. *Id.* at 9. To date, all insulation has been found to be RH. Any motor inside containment found to be unqualified would be replaced. *Id.*

38. A concern was also raised whether Limitorque valve operators are qualified for all installation orientations. *Id.* Applicants have specified procedures for ensuring the proper installation orientation of safety-related electrical equipment, including Limitorque valve operators. *Id.* at 10. The field verification program includes a check of the installation

orientations. No deviations from Limitorque's recommended orientation have been identified. *Id.*

39. Bechtel also raised a concern about whether the installation of drain plugs and orientation of drain holes at other than the lowest point of the operator would affect its qualification. Limitorque has required the installation of drain plugs to prevent moisture buildup on the motor; plugs must be installed in the two lowest drain plug locations. The drain plugs are placed in the limit switch compartments with installation instructions at the time of shipment by Limitorque. *Id.* at 11. Applicants have specifically instructed their personnel, via design documents, how to install drain plugs. *Id.* Installation of these drain plugs is verified as part of the field verification program. *Id.*

40. A concern was also raised whether purchase order and qualification files agree with the installed components. *Id.* at 12. Applicants testified that both CP&L and Ebasco review the qualification documentation against the requirements contained in the purchase order and specifications for the equipment. The equipment is inspected prior to shipment, upon receipt at the site, and after its installation. During the verification program Applicants will be verifying that the equipment, as installed, agrees with the purchase order specifications and other design documents. *Id.*

41. The final concern about Limitorque valve operators is related to the qualification of O-rings. *Id.* Applicants do not believe that this concern is applicable to the equipment employed at Harris. Applicants testified that O-rings cannot be identified without disassembling the equipment. However, Applicants have committed that if the field verification program identifies any equipment component of which qualification appears questionable, the operator will be disassembled and all questionable components will be replaced, including any unidentifiable O-rings. *Id.* at 13.

42. The Staff testified that in light of Applicants' commitment to perform a 100% reinspection of all Limitorque valve operators in a harsh environment, there is reasonable assurance that Applicants' Environmental Qualification Program has addressed the concerns raised in IE Information Notice 83-72. Masciantonio, ff. Tr. 5567, at 11. In addition, the Staff testified that it is possible that during the audit the Staff would tear down a Limitorque valve operator to independently verify its qualification. However, the Staff went on to point out that a decision to do so has not been made at this time. Masciantonio, Tr. 5642-43.

43. Based on the commitment to perform a 100% reinspection of all the Limitorque operators in a harsh environment, the Board finds that Applicants' Environmental Qualification Program adequately addresses

the concerns regarding Limitorque valve operators raised in Contention 9B.

D. Contention 9C: Thermal Aging of RTDs

44. Applicants' witness, Dr. Thomas Dakin, is a consultant for Westinghouse. During his career Dr. Dakin's research activities concentrated on the electrical behavior, and electrical and thermal aging of insulation, both in service and laboratory tests simulating service environment conditions. Dr. Dakin has published papers which discuss most, if not all, of the precautions regarding application of accelerated aging mentioned in the Sandia Report referenced in Contention 9C as well as other precautions. He is a fellow of the IEEE. Miller/Dakin, ff. Tr. 4839, at 2-3.

45. An RTD, a resistance temperature detector, is an instrument used to measure temperature in which the primary element, a resistance wire, has a well-defined resistance temperature relationship. Harris uses RTDs manufactured by the RdF Corporation. There are eighteen Model 21204 RTDs directly immersed in the bypass lines to the reactor coolant system. There are three coolant loops at Harris. The eighteen RTDs are used to measure the "hot-leg" and "cold-leg" temperature in each loop. These RTDs are directly immersed to provide rapid time response measurements for use in the reactor protection and control system. Six Model 21205 RTDs are installed in wells located in the reactor coolant system piping to provide measurement of the hot- and cold-leg temperature in each loop for use in monitoring plant conditions. *Id.* at 4.

46. Thermal aging is a temperature-dependent chemical process which can lead to changes in the properties of organic materials over a period of time. *Id.* at 6. Since real-time aging is not practical over the long periods of time over which electrical equipment must be qualified for nuclear power plants, accelerated processes have been developed to simulate a defined life over a much shorter period of time. *Id.* at 7.

47. The Arrhenius methodology has been developed to simulate accelerated aging. This methodology is based on the premise that deterioration of materials in service is due to chemical reaction. These occur internally, sometimes between components of the material, and sometimes with compounds in the environment such as oxygen or water vapor. Chemical reactions occur more rapidly at higher temperatures. Arrhenius showed that temperature dependence of chemical reactions follows an exponential equation. He postulated a consistent correlation between the amount of physical change and chemical reaction so that the time to reach a selected amount of physical change will vary according to an

equation. *Id.* at 7-8. The rate of thermal aging is the slope of the graph using the Arrhenius equation. *Id.* at 8. It is Applicants' conclusion that other than testing of the material or system for the predicted years of service, this is the most logical scientific way of predicting whether a material or system will be reliable. *Id.* at 9. Type tests for thermal aging are made from 1 to 2 years. After the linearity of the Arrhenius graph for a particular material is confirmed, then short-time, more accelerated tests are acceptable to evaluate small changes in materials or application conditions. *Id.* Generally, the experience has been excellent in confirming the predictions. *Id.*

48. The NRC Staff has concurred in the use of the Arrhenius methodology for thermal aging. *Id.* at 9; Masciantonio, ff. Tr. 5567, at 14.

49. The environmental qualification for the RTDs to be used at Harris includes thermal aging, thermal cycling, irradiation aging, and vibration aging, as a part of the preconditioning process. The RTDs are temperature-cycled to account for plant heatup and cooldown temperatures. They are exposed to radiation for normal and accident conditions. They are also exposed to conditions which simulate pipe and flow vibrations. This process simulates a minimum 20-year life for those RTDs in the bypass line and a minimum of 10-year life for those in the wells. Miller/Dakin, ff. Tr. 4839, at 10. After preconditioning, these RTDs are subjected to the effects of seismic event and high-energy line-break environments. *Id.*

50. Since epoxy is the only age-sensitive material used in the RTD, the activation energy was selected for this material. Using the Arrhenius methodology and the ambient temperature at the cable interface, the aging temperature was calculated which would simulate the desired life at an accelerated rate and not inadvertently degrade the material due to the high temperature alone. *Id.* at 11. The normal ambient temperature equivalent to the normal ambient temperature in the region, plus the expected temperature rise associated with the heat transferred to the interface from the reactor coolant system, is a 49°C plus a 50°C rise. Therefore, the temperature to which these RTDs would be exposed would be 100°C. *Id.*

51. The activation energy chosen was at the low end of the range of activation energies for epoxy resins. Therefore, this activation energy is quite conservative. Dakin, Tr. 4918.

52. The Arrhenius methodology was also used to simulate accident conditions, but only in the post-accident period. The first day, after a high-energy line break, was simulated in real time and temperature. Following the first day of testing, the remaining post-accident period was simulated by accelerated thermal aging. Miller/Dakin, ff. Tr. 4839, at

12. Westinghouse uses a standard accident profile which uses a 0.5 standard electron volt activation energy to determine the time/temperature relationship during this period. RTDs were subjected to this generic profile. *Id.*

53. After the accelerated aging was performed, the RTDs were tested by calibration checks and resistance measurements at 0°C, 274°C, and 329°C as well as insulation resistance measurements. *Id.* No degradation was detected. *Id.*

54. In supporting this contention, Intervenor Eddleman cited a Sandia Report which cautioned using the Arrhenius methodology for accelerated aging. The predicted deficiencies noted in the Sandia Report do not apply to the epoxy used at Harris. The insulation system of the RTD and connector are sealed against moisture so that diffusion of the moisture is prevented. Moisture diffusion is the only potentially invalidating condition referred to in the Sandia Report that could apply to the accelerated aging of RTDs. In addition, epoxy resins are not known to be sensitive to moisture effects as was the polyurethane used in the Sandia Report. *Id.* at 14-15.

55. The Sandia Report concludes that "accelerated aging techniques offer the best opportunity for predicting lifetimes or simulating life of complex equipment." *Id.* at 15; Masciantonio, ff. Tr. 5567, at 14.

56. Dr. Dakin testified that another potential mechanism for degradation of epoxy is oxidation. However, he testified that the requirements on the epoxy in an RTD are minimal, and that it does not have to withstand much voltage. Therefore, it needs almost no dielectric strength. Epoxy could endure large amounts of cracking without harming the function of an RTD, even if oxygen were present. Dakin, Tr. 4924.

57. Epoxy is also relatively insensitive to radiation. Dakin, Tr. 4945. Applicants' witness is not aware of any radiation-caused cracking or diffusion in epoxies. *Id.*

58. The Staff reviewed the basis for Applicants' aging calculations. The Staff is aware of the inadequacies in the Arrhenius methodology. However, it is the best approach currently available to address accelerated thermal aging and has been used in Equipment Qualification Programs of every nuclear power plant in the country. Masciantonio, ff. Tr. 5567, at 13-14. The Staff does not allow reliance exclusively on the Arrhenius methodology of accelerated aging to address the requirements for establishing a qualified life for equipment. Applicants must have a surveillance and maintenance program to account for unanticipated degradation which is not reflected in the results of the accelerated aging process. Combined with the surveillance program, the Arrhenius methodology is

considered acceptable for aging to establish a qualified life. *Id.* at 14. Applicants have committed to a surveillance program in compliance with Regulatory Guide 1.33. *Id.* at 12-13.

59. As stated above, the life of 20-23 years for RTDs was based on an ambient temperature of 50°C and a 50°C temperature rise. The temperature rise is based on heat transfer analyses which presumes 327°C coolant temperature and a 60°C ambient temperature. Conservative activation energy was chosen. The Staff believes that the activation energy chosen by Applicants was conservative because the ranges chosen were those which would give the shortest lifetime for the RTDs. Masciantonio, Tr. 5652. Tests for the NRC performed by Sandia National Laboratory showed that RTD housing temperatures are in the range of 66°C to 93°C for PWR primary coolant temperatures of 316°C and containment temperatures of 42°C. These are consistent with the Harris calculations. Therefore, the Staff judged the methodology used by Applicants for accelerated aging of RTDs to be acceptable and to represent actual plant conditions. Masciantonio, ff. Tr. 5567, at 16.

60. For the reasons set forth above, the Board finds that the use by Applicants of the Arrhenius methodology, coupled with a maintenance and surveillance program, is adequate to demonstrate that the RTDs have been environmentally qualified.

E. Contention 9D: Leakage Currents from Instrument Cables

61. Applicants presented the testimony of Richard M. Bucci and Edwin J. Pagan on this contention. Mr. Bucci is employed by Ebasco Services, Inc., as an Associate Consulting Engineer in the Corporate and Consulting Engineering Department. Mr. Bucci is Manager of Ebasco's Equipment Qualification Program. Bucci/Pagan, ff. Tr. 5166, at 2-3. Mr. Pagan is employed by Ebasco Services, Inc., as a Senior Electrical Engineer. He is responsible for developing and implementing the EQ Program for non-NSSS equipment and supervising the work of the EQ group, which consists of nine multidisciplined engineers. *Id.* at 3-4.

62. Instrument cables are cables constructed of a conductor, insulation, shield, drain wire and overall jacket. They are designed to conduct low-power electrical signals which give information about plant operating conditions such as reactor coolant system pressure, temperature, and containment radiation levels. *Id.* at 6.

63. These cables have been qualified by tests using the methodology employed in IEEE-383-1974. This methodology is endorsed by Regulatory Guide 1.131. *Id.* at 7. These cables are subjected to thermal aging, radiation, and design basis accident conditions as applicable. *Id.* at 8.

The cables are qualified for the worst-case location and most severe environmental conditions that any part of the cable could experience. *Id.* They are exposed to much higher doses of radiation than the most severe doses which could actually be received under normal and accident conditions. *Id.* According to conservative radiation calculations, the maximum normal, plus accident, dose which this instrument cable could receive at Harris is 5×10^7 rads, one-fourth of the dose which the cable sample received during testing. *Id.* After the testing was completed, the cables were required to pass a voltage withstand test which subjected them to additional electrical and mechanical stresses of a greater magnitude than the cables would experience during normal service. This test indicated that margins still existed in the integrity of the insulation after the qualification testing. *Id.*

64. The leakage current is that portion of the signal carried by the cable which is conducted through the insulation to the ground. The insulation resistance is the resistance of the cable insulation to the flow of the leakage current. The leakage current and insulation resistance are inversely proportional to each other. *Id.* The safety implications of reduced insulation resistance depend on the instrument sensitivity. Leakage currents could affect the accuracy of the information transmitted by the instrument. If the instrument is a safety-related instrument, plant safety could be impaired. *Id.* at 9.

65. Both the leakage current and insulation resistance were measured during qualification testing. The leakage current is sensed by a measuring device and converted to an insulation resistance value which is recorded. The insulation resistance of these cables was measured at a minimum prior to the test, after irradiation and at frequent intervals during the design basis accident testing. It was not measured during the radiation test because radiation causes a cumulative change which does not result in fluctuations in insulation resistance during testing. *Id.* at 9-10.

66. Irradiation was not found to result in a significant decrease in insulation resistance. For example, in one sample, the insulation resistance before irradiation was 8.75×10^{10} ohms per 1000 ft. The insulation resistance after irradiation was 1.75×10^{10} ohms per 1000 ft. Insulation resistance values of these magnitudes indicate negligible leakage currents in the circuit. *Id.* at 11.

67. Ebasco is performing insulation resistance calculations which will consider insulation resistance measurements taken during the entire qualification test sequence. The results must show that the quality of the instrument signals will not degrade to a point where the instrument may not be capable of performing its safety function. These results will be

contained in individual environmental qualification packages. *Id.* at 11-12.

68. Therefore, it is Applicants' position that these instrument cables have been reviewed to ensure there will be no adverse effects on the safety functions performed by Harris instrument cables as a result of leakage currents caused by radiation. *Id.* at 12.

69. During Board examination, Applicants' witness Bucci pointed out that the current loss, due to the decrease in the insulation resistance, would be 2×10^{-10} amps, which is too small to measure. Bucci, Tr. 5228.

70. The Staff during its site visit found that the effects of radiation on insulation resistance had been included in the Environmental Qualification Program. Masciantonio, ff. Tr. 5567, at 16. It is the Staff's position that the measurement of insulation resistance gives a direct indication of the leakage current. Staff review of three qualification files on August 9 and 10 determined that leakage current was measured after radiation exposure. The results showed little loss of insulation resistance due to radiation exposure. *Id.*

71. Intervenors did not raise any issues during cross-examination which caused a change in either the Staff's or Applicants' conclusions.

72. The Board finds that Applicants' Environmental Qualification Program takes adequate account of leakage currents resulting from the radiation environment.

F. Contention 9E: Orientation of Installed Equipment

73. Applicants presented the testimony of Mr. Richard M. Bucci, Mr. Edwin J. Pagan, and Mr. Edward M. McLean on this contention. Mr. McLean, a Project Mechanical Engineer, has worked on the installation of electrical and mechanical equipment insofar as the preparation of work packages and process control sheets are concerned to ensure the proper completion of quality control inspection. Bucci *et al.*, ff. Tr. 5234, at 3-4.

74. Generally speaking, the physical orientation of a piece of equipment is not relevant to its environmental qualification. For the most part environmental conditions are identical regardless of the orientation of the particular piece of equipment. Physical orientation is more likely to be related to seismic qualification or operability. However, Applicants testified there are some circumstances where physical orientation could affect environmental qualification. These include, for example, circumstances where a valve operator would be upside down and hydraulic fluid could leak onto cable terminations causing corrosion of the connections. Similarly, incorrect orientation of battery chargers could result in

improper ventilation, and thus raise the temperature for components above the expected normal operating temperature. This could shorten the life of that component. *Id.* at 5.

75. The environmental qualification test reports, provided by the vendors of equipment which is qualified by testing, include sketches of test configurations, including the physical orientation of the tested equipment. The vendor may test the equipment in several manners. First, the vendor may test the equipment in the most limiting orientation, that which causes the most stress on the equipment. Thus, the equipment is environmentally qualified for any orientation. This is the most common form of testing equipment. *Id.*; Bucci, Tr. 5395.

76. The vendor may also test the equipment in a single orientation which is not the most limiting, and qualify equipment by analysis for other orientations; or the vendor may specify that the test orientation is the only permissible orientation. Bucci *et al.*, ff. Tr. 5234, at 6. The vendor may also test in several orientations. He must provide installation and maintenance instructions. He must also provide mounting drawings which include the mounting orientation instructions. *Id.*

77. Ebasco, as the design organization, reviews the test orientation against the design drawings for installation. The orientation during testing must either be identical to the design drawings' orientation or the equipment must be susceptible to qualification by analysis for a different orientation. *Id.* at 6-7. Ebasco also reviews the manual accompanying the equipment to determine its consistency with the test conditions. *Id.* at 7.

78. Applicants also have employed procedures for the review and control of installation documents and documentation of corrective actions which includes physical orientation. Drawings are prepared based on the vendor's information and physical conditions at the equipment locations. They are reviewed by the affected engineering disciplines to ensure adequate consideration of all aspects of plant design. These drawings are sent to vendors for review and correction before they are issued to the field. As part of the Environmental Qualification Program, vendor reports are reviewed to ensure that the test orientation is consistent with the installation drawings. Concerns about orientation are documented in the environmental qualification packages as outstanding items which need resolution prior to considering the equipment qualified. *Id.* In order to change an installation drawing, a design change notification (DCN) must be issued. This is reviewed in the same manner as the original drawings. *Id.* at 8. It is affixed to the drawings so that all affected personnel know of the change and it is given to the field personnel for implementation. *Id.*

79. Applicants ensure that equipment is installed according to the drawings through procedures for control of design documents, preparation of work packages, and quality assurance inspection to verify proper installation.

The construction engineer receives documents from the document control center and prepares the work package. The work package includes installation drawings, vendor drawings, vendor manuals, process control sheets, field change requests (FCRs), and DCNs. *Id.* at 3-9.

80. The work package is sent to the field superintendent to ensure that the equipment is installed according to the documents and notifications. *Id.* at 9. Inspection points of installation are noted at which point quality assurance inspection activities must be conducted. These points are indicated on the process control sheet. An inspector prepares inspection documents. Inspectors examine the work packages when conducting inspections and look at physical orientation. *Id.* at 9-10.

81. If a piece of equipment cannot be installed in accordance with the work packages, and needs a change in installation orientation which exceeds design tolerances in the work package, the construction engineer writes a field change request which must be reviewed by the responsible design engineer. *Id.* at 10. The design engineer evaluates the changes, obtaining additional information from the vendor or Ebasco, if necessary. If the FCR is approved, it is sent to the document control center, forwarded to the construction engineer, and made part of the work package. Then the equipment would be installed. *Id.*

82. If the field change request is denied, and the equipment cannot be installed according to the original design, the design engineer should provide an alternate resolution. *Id.* at 11. If the FCR is denied, an installation cannot be completed as designed, and work stops. The program does not allow the work to be completed and accepted until installation agrees with the design documents. *Id.*

83. At an inspection point such as location, elevation, orientation, and anchor tightening, there are places on the process control sheet with spaces for craft and inspector signatures. These are reviewed by the quality assurance inspector and the construction engineer. Inspection points are provided for those activities that affect the quality of installation. Until the inspection is acceptable, the installation is not acceptable. *Id.* at 11-12. If there is a discrepancy between the design documents and the installation, a nonconformance report is written (NCR). *Id.* at 12. A hold tag is placed on the equipment which may limit the work which can be performed regarding that equipment. Each NCR requires specific disposition, which may include rework. *Id.*

84. An additional assurance is also provided concerning the physical orientation of electrical equipment due to the fact that the startup organization checks the orientation of equipment prior to plant operation. *Id.* at 13.

85. Therefore, Applicants conclude that they have programs to ensure the correct installation of electrical equipment. *Id.* at 13-14.

86. The Staff reviewed certain environmental qualification packages and determined that the installation review procedures of the Applicants demonstrate that the physical orientation of equipment is adequately addressed in the Environmental Qualification Program. Masciantonio, ff. Tr. 5567, at 18. In the Staff's testimony, a concern about interface requirements in the packages reviewed was raised. However, during cross-examination Staff witness Masciantonio concluded that additional information provided during the site visit, and subsequent to that visit, appeared to show that the configuration of the interfaces was representative of the test configuration, and that the Staff's concerns on this matter were alleviated. Masciantonio, Tr. 5689. In addition, during the final walkdown, equipment will be inspected to verify that the installed configuration compares favorably with the test configuration. Masciantonio, Tr. 5688.

87. Intervenor Eddleman proposed only a single finding (35E) on this part of the contention. He cites Eddleman Exhibit 49, which is NRC Inspection Report 83-25 (October 19, 1983). This exhibit was offered in support of Contention 41 concerning pipe hanger inspections, not this contention. It was not admitted into evidence at the hearing because we wished to give further consideration to the Applicants' and Staff's position that only a very limited portion of the Construction Assessment Team (CAT) inspection report is possibly germane to Contention 41.

On the basis of this report, Mr. Eddleman would now have us find that "NRC inspectors have found CI (Construction Inspection) did not have sufficient independence to perform their duties in accordance with an adequate 10 C.F.R. Part 50 Appendix B QA program." We do not believe that any "structural independence" concept relating to the Applicants' QA organization is within the scope of this contention, which relates to the actual orientation of equipment. We, therefore, exclude proposed Exhibit 49 from any consideration under this contention.

88. Based on the above, the Board finds that the Applicants' Environmental Qualification Program provides adequate assurance that the physical orientation of tested equipment is the same as the physical orientation of installed equipment at the Harris site.

G. Contention 9F: Inadequate Consideration of Radiation Effects on Lubricants and Seals

89. Testimony on this part of Contention 9 was provided by Applicants' witnesses Richard M. Bucci, Edwin J. Pagan and Peter M. Yandow.

90. All of the balance-of-plant, safety-related electrical equipment, which is equipment not part of the nuclear steam supply system, is provided by Ebasco, and if located in the harsh environment, is qualified by test. Equipment which normally contains lubricants or seals is tested with those as part of the equipment qualification tests. The tests consist of accelerated thermal aging, radiation, and design basis accident simulation, if applicable. Bucci *et al.*, ff. Tr. 5441, at 4.

91. During the radiation portion of these tests the equipment is irradiated as a whole, including lubricants and seals. The dose to which this equipment is exposed exceeds the total integrated dose to which it could be exposed over its qualified life. The required radiation dose exposure is based on normal operation, design basis accident, and post-accident conditions as applicable. *Id.* at 4-5.

92. Ebasco reviews vendor reports for balance-of-plant equipment to identify organic components of the equipment including lubricants and seals, and compares them with the lubricants and seals supplied or recommended to the vendor to verify that they are the same. If the lubricants and seals are not defined in the test report or a discrepancy exists between those in the reports and those recommended by the vendor, Ebasco attempts to obtain more information from the vendor or corrective action is taken to qualify the component. These corrective actions must be documented in the environmental qualification package. *Id.* at 5.

93. The Nuclear Steam Supply System (NSSS) safety-related electrical equipment is supplied by Westinghouse Corporation. There are lubricants and seals in NSSS equipment in some instances. These seals may be either metallic or organic. *Id.* at 6. Metallic seals are not degraded by the environmental conditions for which electrical equipment must be qualified. Organic seals are qualified as part of the equipment tested. *Id.* Westinghouse has not identified the lubricants used in testing, but recommends a general type of lubricant and provides specifications which the lubricant must meet to ensure operability of equipment. Therefore, CP&L has obtained a lubrication study performed for Harris by the Mobil Oil Company, a leading lubricant vendor, to identify the specific brands of lubricant which can be used for each piece of electrical equipment requiring lubrication. Applicants are presently reviewing the adequacy of this study. The study provides the results of radiation stability testing. This radiation stability testing included standard performance

tests which were conducted both before and during irradiation to measure the effects of radiation. The dose for lubricants will be compared with the total integrated dose the equipment will receive. The test dose must be higher than the qualified dose. Applicants will verify that the manufacturer's lubricant performance specifications have been met. *Id.* at 6-7. There will be an equipment qualification package for documenting tests of the lubricants in the study, and analyses which apply the test results to specific equipment at Shearon Harris. *Id.* at 7.

94. Applicants have concluded that their program adequately addresses the effects of radiation on lubricants and seals. *Id.* at 8.

95. The Staff testified that 10 C.F.R. § 50.49(c)(4) requires that a radiation environment must include the total dose over the installed life of the equipment, irradiation from the most severe design basis accident, and dose rate effects. Applicants have shown that radiation is included in the environmental qualification testing of equipment with lubricants and seals, and other organic materials. Masciantonio, ff. Tr. 5567, at 19.

96. The Staff testified that the effects of radiation on lubricants and seals are accounted for by exposing the equipment to the total dose during the expected life, including lubricants and seals. Where lubricants are other than those tested, the documentation must provide a proper analysis to show that they are qualified for the intended application. The results of the actual test and analyses, with a good surveillance program, will provide assurance that unanticipated degradation is not taking place. The Staff has concluded that Applicants' program properly addresses the effects of radiation on lubricants and seals. *Id.* at 18-20.

97. Intervenor presented no contrary evidence on this subpart, and the cross-examination raised no issues which would cause any change in Applicants' or Staff's conclusions. His proposed finding only emphasized the need for Staff review. The record shows such review has been and will be carried out by Staff.

98. Based on the above, the Board finds that Applicants' Environmental Qualification Program adequately considers the effects of radiation on lubricants and seals.

H. Contention 9G: Test Failures

99. Applicants presented the testimony of Messrs. Robert W. Prunty, Richard M. Bucci, Edwin J. Pagan and Kumar V. Hate on this contention. Mr. Hate is employed by Carolina Power & Light Company's Corporate Quality Assurance Department at the Shearon Harris Nuclear Power Plant as Principal QA Engineer, QA/QC Harris Plant section. He has worked on QA for CP&L since 1974. Prunty *et al.*, ff. Tr. 5515, at

2-3. His responsibilities have included the direction of a team of quality assurance engineers in an overview of the electrical design, procurement and construction installation process from a QA viewpoint for the Harris project. *Id.* at 3.

100. This contention references Item 2 of a report issued by Sandia National Laboratories. Applicants testified that this item is based on inspection reports which document the results of inspections of the Rockbestos Company. The inspection report questions the use of Rockbestos environmental qualification test report QR 2806 to qualify their entire 100 series line of coaxial, triaxial and twinax cables. The Rockbestos Company argued that other members of the product line were qualified by similarity. One product had substantially degraded during previous attempted tests. Degradation observed in previous tests was never discussed in the similarity report. The company had also changed test parameters until they obtained good results. These efforts were never mentioned by the reporting company. *Id.* at 5.

101. Rockbestos cable RSS-6-104/LD is used in the Shearon Harris radiation monitoring system. RSS-6-105/LD coaxial and RSS-6-108/LD triaxial are both used in the electrical containment penetrations. Rockbestos was not the direct cable vendor at Harris. Other than the radiation monitoring systems interconnected cable, there are no Rockbestos cables in the Harris raceway systems. *Id.* at 6.

102. In determining how they would qualify Rockbestos cable, Applicants visited Rockbestos and determined that there was not sufficient documentation to support the use of the original Rockbestos report to qualify cables at Harris. Prunty *et al.*, Supplemental Testimony, ff. Tr. 5515, at 3.

103. Applicants have obtained two test reports, IPS-1053 and IPS-1054, from Conax Corporation which describe environmental qualification testing of penetration module assemblies including Rockbestos RSS-6-105/LD coaxial cables. Applicants have reviewed these reports and determined that the test parameters envelope Shearon Harris parameters for the worst-case locations through which the coaxial and triaxial cables are routed. Applicants testified that the minor differences among the RSS-6-105/LD, RSS-6-104/LD and RSS-6-108/LD cable types do not affect qualification. Thus, Applicants concluded that the qualification testing of RSS-6-105/LD cables is applicable to the other Rockbestos coaxial and triaxial cable used at Harris. *Id.* at 3-4.

104. Conax's quality assurance program has been reviewed by Applicants since it is a direct vendor to CP&L and its quality assurance program has been found acceptable. *Id.* at 4.

105. With regard to the two Rockbestos firewall cables, Applicants have received two test reports which describe environmental qualification research tests performed by Sandia National Laboratories on Firewall III control cables. Shearon Harris cables are one of the cable types tested in these reports. NUREG/CR-2932 and NUREG/CR-3588. Applicants have determined that the test parameters envelope applicable Shearon Harris parameters for the worst-case locations for both types of cable. In addition, the control cable is representative of the thermocouple cable for environmental qualification purposes, since all the features of the two cables significant to environmental qualification are the same. The thickness of the insulation material on the thermocouple cable is 25 mils compared to 30 mils on the control cable. However, the thermocouple cable wires are covered by a metallic shield and Hypalon overall jacket, which more than compensate for this minor difference in thickness. Prunty *et al.*, Supplemental Testimony, ff. Tr. 5515, at 5-6; Bucci, Tr. 5560. Applicants' witness also testified that the control cable was stressed to 480 volts rather than the milivolts which would be used on the thermocouple cable. Bucci, Tr. 5561. Therefore, it is Applicants' position that the Environmental Qualification Program can demonstrate the qualification of the limited number of Rockbestos cables used at Harris. Prunty *et al.*, Supplemental Testimony, ff. Tr. 5515, at 6.

106. Applicants testified that they have reasonable assurance that significant test failures have been identified or have not occurred. In specific vendor test programs initiated at the request of one or more customers, a test plan and test procedure are approved by the customer(s) prior to actual testing. Specific numbers and types of test samples are delineated. Upon completion of testing, data gathered with respect to each sample, as well as the conclusions drawn, are presented in the report. Applicants testified that it would be apparent if the vendor had not reported test results on any of the samples. Prunty *et al.*, ff. Tr. 5515, at 10.

107. In addition, Applicants have taken steps to assure the quality of vendors. Suppliers are evaluated before contracts are awarded. Visits are made to supplier's facilities. *Id.* at 12-13. Vendors may be qualified by an audit, or by acceptance of the vendor's ASME certification, by acceptance of the NRC, or by qualification through the CASE system. In the CASE system another utility has performed an audit of the vendors in question. Hate, Tr. 5529-30. In the case of Conax, Applicants qualified this vendor through the CASE system. Hate, Tr. 5529.

108. The Staff testified that Part 21 of the Commission's Regulations requires that all environmental qualification test facilities must report all

test failures and test results which could affect safety. In addition, the requirements for quality assurance programs at vendors' facilities are detailed in Appendix B to 10 C.F.R. Part 50. This section of the regulations also requires that all results of environmental qualification tests be documented and reported. There are also industry standards which are explicit in the requirement to report all qualification tests results. Masciantonio, ff. Tr. 5567, at 20.

109. In August of 1982, the NRC instituted a vendor inspection program to assess test facilities' QA programs. This program has found numerous nonconformances which have subsequently been corrected. The specific case cited in this contention is based on one inspection of the Rockbestos Company. It was, and still is, concluded by the Staff that environmental qualification of these cables has not been established based on the documentation provided by Rockbestos. *Id.* at 20-21.

110. The Staff set forth its findings concerning the Rockbestos Company in Information Notice 84-44. The Staff suggested the possible courses of action which could be taken to qualify Rockbestos cables, which are: (1) a valid qualification test could be performed of the installed Rockbestos cables; (2) an Applicant could obtain documentation from other available qualification tests already performed, and determine its applicability to the installed cables; and (3) Applicants could perform analyses of the existing qualification reports applicable to the installed cables to ensure that the documentation relied upon to demonstrate environmental qualification supports such a conclusion. *Id.*, Attach. 3, at 2-3.

111. The Staff reviewed Applicants' supplemental testimony on this contention, and testified that the approach described in that testimony is consistent with the pertinent Staff suggestions in Information Notice 84-44. Masciantonio, Tr. 5585.

112. Intervenors did not present evidence either direct or by cross-examination which would raise a question as to the adequacy of the Applicants' environmental program to address concerns regarding test failures with regard to Rockbestos cables. The Board resolves this issue in favor of the Applicants.

I. Conclusion

113. The Board finds that the seven issues raised in this contention have been satisfactorily addressed in the Applicants' Environmental Qualification Program. No significant deficiency was raised through cross-examination. This contention is resolved in favor of the Applicants.

V. CONTAINMENT CONCRETE

A. Introduction

1. As originally admitted by the Board on September 22, 1982, Eddleman Contention 65 stated as follows:

Because Daniel International, CP&L's prime contractor on the Harris project, has a history of building defective basemats and containments (e.g., Callaway, Wolf Creek, Farley) a complete ultrasonic reexamination of the containment and basemat, able to detect voids over 1 inch in any size (any dimension over 1") therein, or another type of examination with similar capabilities to detect voids, is necessary before Harris 1 is allowed to operate. Otherwise, the voids could become (through cracking from thermal stress, concrete aging, or external impact) paths for radioactivity to leak from containment at unforeseeable times, including during rad releases inside containment, e.g. from reactor and primary system relief valves after a reactor trip or feedwater trip.

Supplement to Petition to Intervene by Wells Eddleman at 171 (May 14, 1982); Memorandum and Order (Reflecting Decisions Made Following Prehearing Conference), LBP-82-119A, 16 NRC 2069, 2101 (1982).

2. In a telephone conference on July 12, 1984, the Board announced its decision to grant in part and deny in part Applicants' Motion for Summary Disposition of Eddleman Contention 65 (January 18, 1984). As a part of its ruling, the Board substituted the following language for the original Contention 65, to reflect the matters which remained in dispute:

Inspection of CP&L concrete pour packages has shown that numerous instances of improper concrete placement have occurred in the basemat and containment structure. In view of this, a complete examination of the basemat and containment structure must be conducted using ultrasonic techniques or, where use of such techniques is not feasible, other appropriate tests.

Tr. 2168-69. The Board further ruled that the concrete pour packages at issue are those discussed in Wells Eddleman's Response to Summary Disposition Motion on Eddleman 65 (Concrete) (June 14, 1984), and the accompanying affidavit of Charles C. Stokes, with the exception of matters related to the waterstop, which the Board excluded by rejecting proposed Eddleman Contention 65-B. Tr. 2172-75. The Board also held that the second sentence of the revised contention (on testing) would not be at issue unless litigation of the first sentence revealed actual defects in the concrete. Tr. 2170.

3. Following the receipt of evidence on Eddleman Contention 65 and prior to the adjournment of the hearing on safety matters, the

Board, on its own initiative, reached a tentative decision on that contention. Tr. 7368-70. As Applicants pointed out in their proposed findings, the Board "tentatively concluded that there is no basis for questioning the integrity of the concrete in the Harris containment." Tr. 7369. In explanation of the grounds for its tentative decision, the Board stated its findings that "the Applicant and Staff direct cases were very convincing," and "that those cases were not shaken by the cross-examination." *Id.* With respect to Eddleman witness Stokes, the Board found that: (1) he "was rather substantially impeached in his presentation"; (2) "he retracted much of his testimony previously filed"; and (3) he did not raise "any questions of a safety nature about the containment concrete." *Id.* The Board, therefore, adopted the direct testimony of Applicants and the Staff as its tentative decision in favor of Applicants and the Staff on Eddleman Contention 65. Tr. 7369-70.

4. The Board provided Mr. Eddleman with the opportunity to file proposed findings on Contention 65, if he wished to continue to pursue the matter. In view of the Board's tentative decision and the state of the record, any proposed findings by Mr. Eddleman were to be filed by December 21, 1984. Applicants and the Staff were provided the opportunity to file any reply on or before January 4, 1985. Tr. 7369-70.

5. Mr. Eddleman filed proposed findings on December 21, 1984; Applicants replied on January 4, 1985, and the Staff filed a reply on January 11, 1985.

B. The Record

6. In opposition to Applicants' motion for summary disposition and in support of his newly proposed Contentions 65-A and 65-B, Mr. Eddleman filed the affidavit of Charles C. Stokes on June 14, 1984. The Stokes affidavit evaluated thirteen containment concrete pour packages²⁰ produced by Applicants during discovery. These same thirteen pour packages became the exclusive subject of controversy as a result of the Board's ruling of July 12, 1984. See ¶ V.A.2, *supra*. In the affidavit of Roland M. Parsons filed in support of Applicants' Response to Eddleman Proposed Contentions 65-A and 65-B (June 29, 1984), Applicants provided a point-by-point refutation of Mr. Stokes' evaluation of each of the thirteen pour packages.

²⁰ A "concrete pour package" is the assemblage of documentation for each concrete placement, which is required to be retained by Quality Assurance in its records vault. See Applicants' Testimony of George A. Kanakaris, Roland M. Parsons and Larry F. Garner in Response to Eddleman Contention 65 (Concrete Containment Structure), ff. Tr. 5764, at 10.

7. Thus, well in advance of the August 9, 1984 deadline for filing direct testimony and exhibits, Mr. Eddleman knew not only the identity of the concrete documentation at issue, but also Applicants' defense to Mr. Stokes' evaluation of that documentation. Yet, Mr. Eddleman filed no new or revised testimony responsive to Applicants' positions. Instead, he chose to rely on the Stokes affidavit of June 14, 1984, as testimony in support of Contention 65. Indeed, not until it was time for Mr. Stokes to take the witness stand on October 30, 1984, did Mr. Eddleman and his witness attempt to come to grips with the other parties' positions.

8. Applicants' direct testimony, filed on August 9, 1984, again included the point-by-point response to the Stokes affidavit (Kanakaris *et al.*, ff. Tr. 5764, at 13-22). The NRC Staff's direct testimony, filed on the same date, included an even more detailed response to the Stokes affidavit. See NRC Staff Testimony of John R. Harris, Joseph J. Lenahan and Paul R. Bemis on Eddleman Contention Number 65, Concrete Placement, ff. Tr. 6320 (hereinafter "Harris *et al.*"), at 11-50. Nevertheless, it was only on the third day of Mr. Eddleman's examination of Applicants' witnesses that the Board and parties were informed that Mr. Eddleman's witness had abandoned some undefined portion of his testimony upon review of the information provided in the testimony of Applicants and the NRC Staff. A recess was required at that point in order for Mr. Eddleman and his witness to confer and to reach a position on the subjects which remained in controversy. See Tr. 6035-45. Consequently, not only had substantial hearing time been wasted on examination of Applicants' witnesses on matters later abandoned by the Intervenor, but hearing time was also expended while he determined what the areas of controversy actually were and while the witness and the Intervenor proceeded to edit Mr. Stokes' testimony on the record. See Tr. 6046-68. All of this could have occurred prior to the filing of testimony on August 9, and should in any case have occurred prior to October 30, 1984. The path followed, however, is partially responsible for a record which the Board described as "extremely convoluted and confused." See Tr. 7370.

9. Applicants' panel included three witnesses. Mr. Kanakaris is Manager of Civil Engineering for Ebasco Services, Inc., the architect/engineer for Harris. He is responsible for direction of all civil engineering and design of Ebasco power plant projects, and has over 25 years of experience in the civil engineering and design of generating stations (Kanakaris *et al.*, ff. Tr. 5764, at 1). Mr. Parsons, also a civil engineer, has been employed by CP&L at the Harris site since major construction activity was undertaken in 1976. Previously Project General Manager of the Harris Plant Construction Section, Mr. Parsons

The Staff testimony was not challenged during cross-examination. The Board finds Mr. Eddleman's statement that there is "no evidence" of corrective action to be not only wrong but in culpable disregard of the record.

16. Eddleman's Proposed Finding 9 cites Mr. Stokes' view that "you generally do not want the slump below 2 inches" (Tr. 6140-41). We note that none of the 160 slumps reported in the referenced pour packages were less than 1½ inches and only 10 were less than 2 inches. Kanakaris, Tr. 6102. Since stiff or low-slump concrete has maximum strength, low slump is desirable. Staff's expert witnesses had the view that "you can place concrete easily with a 2 inch slump or a 1½ inch slump." (Lenahan, Harris, Tr. 6395.) The Board agrees with the Staff witnesses.

17. The remainder of Mr. Eddleman's proposed findings are concerned with the strength testing and evaluation of placement ICBXW29001 (Applicants' Exh. 14). These proposed findings do not reflect the record accurately. As succinctly summarized in the Staff testimony (Harris, *et al.*, ff. Tr. 6227, at 26-27), test cylinders from this placement had an average strength of 4865 psi at 28 days, which is slightly less than the required design strength of 5000 psi. Therefore, nonconformance number C-508 was issued. The reserve cylinder set was tested at 90 days and showed an average strength of 5660 psi which is well above the design strength. The Board finds the Applicants properly identified a nonconformance and properly resolved it.

In addition, the Licensee drilled five cores in this placement for testing. Because of reinforcing steel congestion, the diameter of the cores was limited to 1¼ inches. Three of the cores tested satisfactorily and two did not. Staff testimony was that "experience has shown that test results from cores of this size are variable." The Board does not find a basis for concern in these results, particularly in view of the satisfactory results from the test cylinders at 90 days.

Mr. Eddleman would have us find that many errors are present in these pours. We find only one. Lab test 9323 is shown in Applicants' Exhibit 14 as a sample from Placement ICBXW29001. As reported in the Staff testimony, this sample came from ICBXW296003. The low strength (4105 psi) in this test lead to Nonconformance Report C-507. Ninety-day test results on the reserve cylinder of 5040 psi (40 psi above required design strength) form the basis for resolving this nonconformance. The Board finds the error in tabulating the lab tests undesirable but without any ultimate harm. Clearly, the record does not support Mr. Eddleman's proposed conclusion that a pattern of widespread errors may have occurred.

18. The Board finds the record provides no evidence that concrete was inadequately placed during the Harris construction of the containment building, but rather the record demonstrates the Applicants' proper identification of a few nonconformances and proper resolution of these items. This contention is resolved in favor of the Applicants.

VI. SUMMARY DISPOSITION RULINGS

Prior to the safety hearings, the Board granted the Applicants' summary disposition motions with respect to Eddleman Contention 11, concerning polyethylene cable insulation, and 132C(II), concerning control room design. We stated at that time that we would set forth the reasons for those rulings at a later date. Tr. 2167. Those reasons follow:

Contention 132C(II)

Eddleman Contention 132C(II) states as follows:

With respect to layout [of the Control Room], [Applicants'] proposal arranges control and display cabinets such that they block or impede view of some others (see Fig. 1, p. 12, where view of/from panels 8, 9, 10 & 11 is obscured by #'s 12, 13, 14 and 15 from #'s 6, 7, and 1, 2, 3, 4 and 5. #6 and 7 are hidden from operators by 1 and 2 (as well as 3, 4 and 5). #'s 16 and 17, the incore instrumentation and nuclear instrumentation system are almost totally behind the 2 blocks 1 through 5 and 6-7 with respect to the radiation monitor equipment panels 12 through 15, the 8-11 block (startup and generator) and the 1-5 block's sections 1 through 4 and possibly 5. Operator inability to see, read accurately, or integrate the information on these panels can imperil public safety in an accident.

This contention was accepted by the Board in a Memorandum and Order of October 6, 1983. Discovery was conducted by the parties and on May 9, 1984, Applicants submitted a Motion for Summary Disposition. Staff responded in support of Applicants' motion on May 29, 1984. Applicants submitted the Affidavit of Raymond G. Ramirez. Mr. Eddleman responded to Applicants' motion on June 14, 1984.

The control room at Shearon Harris was laid out according to the recommendations resulting from a detailed control room design review conducted by CP&L with Ebasco Services, Inc. (Architect/Engineer), Westinghouse Corp. (NSSS Vendor) and Essex Corp. (Human factors consultants). Prunty Affidavit, ¶¶ 4-5. Three operating positions were chosen at the main control board because of their proximity to the Reactor Controls, Emergency Safeguards and Emergency Power controls and

displays. The position of equipment panels other than the main control board were then optimized for operator visual access. *Id.* ¶¶ 6-7. Mr. Eddleman alleges that regardless of the design process used by Applicants there are points in the control room where an operator would have his view of certain panels blocked by other panels, and specifies them in his contention. Applicants agree that this is true, but that Mr. Eddleman errs in essentially assuming that all panels must be visually accessible to all operators.

Applicants point out that NRC regulations require that two operators, one of whom is a senior operator, must be in the control room and that one operator must be at the controls at all times. 10 C.F.R. § 50.54(m)(2)(i) and (iii). Applicants expect that a majority of the time there will be three operators and a shift foreman in the control room. Prunty Affidavit, ¶ 8.

Mr. Eddleman's first situation in his contention is that operator view of panels 8, 9, 10 and 11 are obscured by panels 12, 13, 14 and 15. However, this is true only if the operator is standing at panels 1 through 5 or at panels 6 and 7. Applicants state that operators are not ordinarily stationed at panels 1 through 5, but even if an operator were in that position, the other operator or operators would have visual access to panels 8 through 11. *Id.* ¶¶ 8, 9.

Mr. Eddleman's second concern is that panels 6 and 7 are obscured by panels 1 through 5. The Applicants agree, but state that panels 6 and 7, which have to do with Cooling Tower and River Water Makeup Control and Condensate Booster Hydraulic Coupling Control, are neither safety-related nor are required to be operated in an accident scenario. *Id.* ¶ 10. The third concern in the contention is that panels 16 and 17 (Incore Instrumentation and Nuclear Instrumentation System) are obscured by panels 1-5 and 6 and 7, and/or panels 12-15, and/or panels 8-11, assuming that the operator is located at various positions across the room from panels 16 and 17. As with Mr. Eddleman's first concerns, the operator positions necessary to cause such blockage are not typical, but even if an operator were at one of these there would be visual access for the other operator or operators. *Id.* ¶ 11.

The Staff's affiant, Mr. Ramirez, having reviewed the Applicants' motion and related documents, visited the Shearon Harris control room and physically determined the visual access available to operators in various positions in the control room. He found that the blocking of visual access of certain panels from certain positions was as Mr. Eddleman alleges, but he also agreed that Applicants' arguments that such blocking is unlikely or of no importance to safety are valid. Ramirez Affidavit, ¶¶ 7-9.

Mr. Eddleman's response to Applicants' motion touched in principal part concerns beyond the scope of his contention. The Board found no litigable substance to it. The Board therefore finds, based on Applicants' arguments which were corroborated by the Staff, that no material fact exists to be litigated in this proceeding concerning control room configuration, and the contention is therefore dismissed.

Contention 11

Eddleman Contention 11 states as follows:

Applicants' FSAR and the SER are deficient and in error because they do not take account of the fact that polyethylene used as cable insulation, deteriorates much more rapidly under long-term doses of gamma radiation than it does when exposed to the same total dose over a much shorter period of time (which is how this material, PE, is tested for service in nuclear plants), as shown by the work of K. Gillen and P. Clough of Sandia Laboratories. The tests these workers conducted show that the insulation becomes embrittled by the radiation's breaking chemical bonds in these polymers (which are long groups of linked chemical units called 'mers' allowing oxidation of the plastic PE which makes it brittle).

This contention was admitted by the Board in its Memorandum and Order of September 22, 1982 (LBP-82-119A, 16 NRC at 2091-92). Discovery was conducted by the parties, and on May 25, 1984, Applicants moved for summary disposition, submitted the affidavits of Richard M. Bucci and of Peter M. Yandow, Edward M. Stendel and Harold W. Bowles. Staff responded in support of Applicants' motion on June 18, 1984, submitting the affidavit of Armando S. Masciantonio. Mr. Eddleman responded on June 29, 1984.

In the course of discovery it was determined that polyethylene is not used as electrical cable insulation at Shearon Harris, and, to Applicants' knowledge, is not used as insulation on any electrical equipment inside containment. Bucci Affidavit, ¶¶ 31-32. This fact was affirmed by the Staff. Masciantonio Affidavit, ¶ 4. The Board therefore found the contention to be moot and dismissed it from the proceeding.

In this response to Applicants' Motion, Mr. Eddleman did not attempt to defend Contention 11, but did suggest that the Board might look into radiation effects on neoprene insulation, which he states is used in Shearon Harris cables, to see if a Board question on the subject might be appropriate. The Board did review the information received from the parties, i.e., the three affidavits received from Applicants and the Staff, as well as Mr. Eddleman's own pleadings, but could find no significant safety concern therein. The Board therefore declined to entertain Mr. Eddleman's suggestion.

VII. CONCLUSIONS OF LAW

The safety matters in controversy in this proceeding are limited to those raised by the Intervenor. 10 C.F.R. § 2.760a. As reflected in the foregoing opinion on management capability and findings of fact on other contentions, those matters have (with a few exceptions to be addressed later) now been resolved in favor of the Staff and the Applicants and against the Intervenor. Based on that opinion and those findings of fact, the Board concludes that as to the contested safety matters addressed herein, there is a reasonable assurance that, if an operating license is subsequently granted for the Harris facility, the activities authorized thereby can be conducted without endangering the health or safety of the public and that such activities will be conducted in compliance with applicable NRC regulations.

VIII. APPEALS

Pursuant to 10 C.F.R. §§ 2.760(a) and 2.762, an appeal from this Partial Initial Decision or from any prior Board Order granting a motion for summary disposition, in whole or in part, of a safety contention or excluding a proposed safety contention from litigation may be taken by filing a notice of appeal with the Atomic Safety and Licensing Appeal Board within 10 days after service of this Decision.²¹ A brief in support of an appeal must be filed within 30 days after the filing of the notice of

²¹ Although this Decision does not authorize issuance of a license or resolve all pending safety issues (because of conflicting and higher priority assignments of the Board members), it does resolve a "major segment of the case" and is therefore appealable at this time. See *Boston Edison Co. (Pilgrim Nuclear Power Station, Unit 2)*, ALAB-632, 13 NRC 91, 93 n.2 (1981).

The Applicants' unopposed motion of December 20, 1984, concerning transcript corrections is granted and the evidentiary record shall be deemed amended to incorporate said changes.

appeal (40 days if the appellant is the NRC Staff), any other party may file a brief in support of or in opposition to an appeal.

THE ATOMIC SAFETY AND
LICENSING BOARD

James L. Kelley, Chairman
ADMINISTRATIVE JUDGE

Dr. James H. Carpenter, Member
ADMINISTRATIVE JUDGE

Glenn O. Bright, Member
ADMINISTRATIVE JUDGE

Bethesda, Maryland
August 20, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Dr. Robert M. Lazo, Chairman
Dr. Richard F. Cole
Dr. Emmeth A. Luebke

In the Matter of

Docket Nos. 50-250-OLA-1
50-251-OLA-1
(ASLBP No. 84-496-03-LA)
(Vessel Flux Reduction)

FLORIDA POWER AND LIGHT
COMPANY
(Turkey Point Nuclear Generating
Plant, Units 3 and 4)

August 16, 1985

In this Order the Licensing Board rules on Licensee's motions for summary disposition of Intervenor's two admitted contentions in this operating license amendment proceeding. The motion for summary disposition of Intervenor's Contention (b) is granted. The motion for summary disposition of Intervenor's Contention (d) is denied.

RULES OF PRACTICE: SUMMARY DISPOSITION

Under 10 C.F.R. § 2.749(d) a motion for summary disposition will be granted when the record shows that there is no genuine issue as to any material fact, and that the moving party is entitled to a favorable decision as a matter of law.

RULES OF PRACTICE: SUMMARY DISPOSITION

Summary disposition is available in hearings on amendments to licenses.

TECHNICAL ISSUES DISCUSSED

ECCS evaluation model, peak cladding temperature, fuel design limits, heat transfer coefficients, Appendix K, critical heat flux, departure from nucleate boiling (DNBR).

ORDER

INTRODUCTION

Before us are two motions from the Licensee for summary disposition, two motions to strike which are related to the motions for summary disposition, and a motion from the Intervenors for suspension of the license amendments which are the occasion of this proceeding. We grant one summary disposition motion, on Contention (b), deny the other, and deny the motions to strike and the motion to suspend.

We begin with a brief account of the origin and course of this proceeding, one of three dealing with amendments to the licenses for Units 3 and 4 at Turkey Point. In the course of this account, we rule on the motions to strike, and we pay particular attention to the prehearing conference we held on the summary disposition motions to aid us in determining whether any genuine issues existed concerning any material fact. Though the Intervenors had supported the holding of this conference, they ultimately objected to it. We set out our reasons for holding it, and for conducting it as we did. After this account of the origin and course of this proceeding, we shall rule on the summary disposition motions and on the Intervenors' motion to suspend the amendments, which is closely tied to Intervenors' Contention (b).

HISTORY OF THIS PROCEEDING

By letters dated August 19 and September 9, 1983, the Licensee requested amendments to the technical specifications of Licenses DPR-31 and DPR-41, to support the Licensee's program for reduction of neutron bombardment (vessel flux), and consequent embrittlement, of the pressure vessel walls, and to remove restrictions imposed when

the Licensee was operating with steam generators having a larger number of plugged tubes than the steam generators which the Licensee is now using.

Notice of the proposed amendments was published in the *Federal Register* on October 7, 1983, 48 Fed. Reg. 45,862-63. In response to the notice, the Center for Nuclear Responsibility (CNR) and Joette Lorion filed a joint petition to intervene. The NRC Staff (the Staff) issued the amendments on December 23, 1983, stating that the amendments posed no significant hazards and therefore, under 10 C.F.R. § 50.91(a)(4), could be issued without a hearing on the contentions filed by the Intervenor.

The Intervenor filed an amended petition on January 25, 1984. We ruled on the contentions filed then, and on other matters, in our May 16, 1984 Order (unpublished). We admitted only Contentions (b) and (d), each of which is now the subject of a motion from the Licensee for summary disposition. Contention (b) alleges shortcomings in one of the computer models which, when functioning together, yield predictions of the temperature of the hottest rod in a reactor core during reflood of the core after a loss-of-coolant accident (LOCA). Contention (d) alleges that under the amendments there is an increase in the probability that films of steam will form around the fuel rods during normal operation and certain abnormal occurrences other than LOCAs. Such films reduce transfer of heat away from the rods. The chief concern of both contentions is that operation under the amendments not increase the risk that the integrity of the cladding of the fuel could be threatened.

The Licensee filed motions for summary disposition on August 10, 1984. Along with the motions, the Licensee also submitted a memorandum of law, statements of material facts as to which the Licensee contended that no genuine issues existed (required by 10 C.F.R. § 2.749(a)), and affidavits from Mark J. Parvin and Edward A. Dzenis, both of Westinghouse Electric Corporation (Westinghouse). Mr. Parvin, whose affidavit is in support of summary disposition of Contention (b), is senior engineer in the Reload Safeguards Analysis Group of the Nuclear Safety Department in the Nuclear Technology Division of Westinghouse. His professional work has included analyses of LOCAs and preparation of computer code input data for these analyses. Mr. Dzenis, whose affidavit is in support of summary disposition of Contention (d), is Manager of Thermal and Hydraulics Design for the Nuclear Fuel Division of Westinghouse. His principal professional work is management of thermal-hydraulic analysis of fuel for pressurized water reactors (PWRs) which are supplied by Westinghouse. The PWRs at Turkey Point are Westinghouse reactors.

On September 4, 1984, the Staff filed responses in support of the motions. The responses were accompanied by affidavits from Summer B. Sun, on Contention (b), and Yi-Hsiung Hsui, on Contention (d). Both Dr. Sun and Dr. Hsui are nuclear engineers in the Core Performance Branch of the Division of Systems Integration, Office of Nuclear Reactor Regulation of the Nuclear Regulatory Commission. Dr. Sun's professional work includes review of models of core thermal-hydraulic behavior during LOCAs and other abnormal occurrences. Dr. Hsui's work includes technical review of safety evaluation reports and methodological topical reports submitted by applicants and licensees.

On September 4, 1984, the Intervenor responded in opposition to the motions and submitted affidavits from Joette Lorion — who is one of the Intervenor and Research Director of CNR, which is the other Intervenor — and Dr. Gordon D.J. Edwards, President of the Canadian Coalition for Nuclear Responsibility and Professor of Mathematics and Science at Vanier College, Montreal, Canada. Both affiants spoke to both contentions. The opponent of a motion for summary disposition is required by 10 C.F.R. § 2.749(a) to submit a statement of material facts as to which the opponent contends there exists a genuine issue. The Intervenor did not submit such a statement.

THE MOTIONS TO STRIKE

On September 21, 1984, the Licensee filed a motion to strike both the Intervenor's response and the accompanying affidavits. The Licensee argued that the response should be struck because it was not accompanied by statements of material facts as to which it was contented that no genuine issue existed. Licensee's Motion to Strike at 9-10. The affidavits should either be struck, or the facts as asserted by the Licensee deemed admitted as true, the Licensee argued, because the Intervenor had not met the burden, imposed by 10 C.F.R. § 2.749(b), of showing affirmatively in the affidavits that the affiants were competent to testify to the matters stated in the affidavits. The Licensee cited cases indicating that such competence was to be shown by education or experience which gave the affiant some special knowledge or skill germane to the matters discussed in the affidavits, and that neither a well-informed layperson's general familiarity with issues surrounding nuclear power, nor expertise in an unrelated field of science or engineering, was sufficient proof of an affiant's competence. *Id.* at 3-4. The Licensee argued that affiant Lorion, despite her title of Research Director, had no more than a layperson's knowledge of the issues in the proceeding (*id.* at 4-7), and that

Dr. Edwards, though a mathematician, had not shown that he had an expert's knowledge of computer modeling of the behavior of a reactor core (*id.* at 7-9). The Licensee also argued that some of Dr. Edwards' statements amounted to attacks on some of the Commission's regulations and should be struck for that reason alone. *Id.* at 10-12.

The Staff responded on October 9, 1983, largely in support of the Licensee's motion to strike, though granting Ms. Lorion a general familiarity with nuclear issues, and construing Dr. Edwards' statement that as an applied mathematician he had been keenly interested in mathematical modeling to mean that he had expertise in such modeling. See Edwards' Affidavit, Exh. A at 3; Staff's Response at 6-7.

On October 12, 1983, the Intervenor's responded to the Licensee's motion to strike with, among other things, their own motion to strike the Licensee's motion to strike. The Licensee responded to the Intervenor's motion to strike on October 17, 1983. The Intervenor construed the Licensee's motion to strike as an unauthorized reply to the Intervenor's answer to the Licensee's motions for summary disposition.¹ We, however, construe the Licensee's motion to strike differently. It does not address, as a reply would, the merits of the Intervenor's arguments against summary disposition. Rather, it confines itself to the procedural sufficiency of the Intervenor's response and affidavits. The Licensee's motion to strike is simply that, a motion to strike, and thus is to be either granted or denied, but not stricken. We therefore deny the Intervenor's motion to strike the Licensee's motion to strike, and go on to consider the merits of the Licensee's motion to strike.

In their response to the Licensee's motion to strike, the Intervenor's make only oblique defenses of their affiants' competence to testify to the matters they discuss in their affidavits. In defense of Ms. Lorion's qualifications, for instance, the Intervenor's appear to concede the Licensee's point. "Joette Lorion has not represented herself to be an expert witness in the nuclear field" Intervenor's Response to Licensee's Motion to Strike at 4. Nonetheless — or rather, somehow therefore — the Intervenor's conclude (using a wonderfully self-illustrating phrase) that "a finding by this Board that she is unqualified would be inappropriate and superfluously redundant." *Id.* at 5. The Intervenor's also say that the affiants "have had no fair opportunity to defend their professional

¹ The Intervenor's apparently are relying on 10 C.F.R. § 2.730(c), which says, among other things, that "the moving party shall have no right to reply, except as permitted by the presiding officer or certain other officers of the Commission."

qualifications." *Id.* at 3. Yet the Licensee's motion to strike provides just such an opportunity.²

We nonetheless deny the Licensee's motion to strike. We deny it as it applies to the Intervenor's affidavits in opposition to the motions for summary disposition. We are inclined to think that in a proceeding where safety is at stake, a motion to strike a filing and affidavits on summary disposition is most useful when it is directed at a *proponent* of a motion for summary disposition who puts forward, on the basis of questionable competence, technical arguments before a judicial panel wholly unprepared by education or experience to distinguish competence in technical matters from incompetence in the same. In such a situation, without the motion to strike, safety may receive less than its due.

Here, however, the context of the motion to strike is quite different. First, it is the opponent of summary disposition who puts forth the challenged affidavits. If on the strength of the opponent's representations, the motion for summary disposition is denied, the proponent still has a chance at hearing to persuade the judges that his case is sound. Second, the challenged filings consist, in most telling part, of claims quoted and paraphrased from technically competent Staff discussions, and we found the Intervenor's emphasis on those discussions helpful as a starting point for our coming to a fuller understanding of the technical questions raised by the parties' filings. Last, the members of this Board are, by both education and experience, together competent in several fields related to nuclear power. Denial of the motion in no way compromises safety, and the proponent of the motion can at the hearing challenge the competence of the opponents' witnesses under the more rigorous rules applicable where an evidentiary record is being built.

We also deny the Licensee's motion to strike as it applies to the Intervenor's response to the motions for summary disposition. As the Staff points out (Staff's Response to Licensee's Motion to Strike at 3 n.2), under 10 C.F.R. § 2.749(a), the Intervenor's failure to file statements of the material facts as to which the Intervenor contends there exist genuine issues is grounds not for striking the Intervenor's response, but for deeming as admitted the facts as set forth in the Licensee's statement of material facts as to which the Licensee contends no genuine issues exist. Finally, though we grant that some of Dr. Edwards' statements in

² The Intervenor also make a general defense of their response to the motions for summary disposition. They argue that, simply by having admitted Contention (b), "the Board has already acknowledged that the Intervenor have raised a substantial issue of material fact suitable for disposition at hearing." Intervenor's Response to Licensee's Motion to Strike at 2. Such a view of the legal significance of the admission of a contention leaves no room for summary disposition.

his affidavit can be read as attacks on some of the Commission's regulations, we construe those statements another way in our discussion of Contention (b).

THE PREHEARING CONFERENCE ON MARCH 26, 1985

We found the pleadings and the rest of the written record insufficiently informative for a determination of whether there existed genuine issues about material facts. We therefore called, on February 8, 1985, for a prehearing conference to be held on March 26, 1985, and we ordered that the Licensee be prepared to make didactic presentations in response to issues raised in the parties' filings. In the February 8 Order, we listed, as examples, several such issues.

On February 19, 1985, the Licensee filed a motion calling upon us to clarify or reconsider our decision to hold a prehearing conference on the summary disposition motions. The Licensee claimed such a conference would provide opportunity for testimony that the other parties might regard as unfairly surprising. Motion for Reconsideration at 7. The Licensee noted that the Commission's regulations consistently speak of summary disposition as judgment on the pleadings, and make no mention of oral testimony as a basis for summary disposition. *Id.* at 3-4. Although the Licensee recognized that there were federal court cases in which oral testimony had, at the discretion of the judge, been given on summary disposition, the Licensee nevertheless argued that this discretionary power was derived from a rule of federal civil procedure for which there was no analogue in the Commission's regulations. *Id.* at 5.

Since the Licensee thought that the pleadings supported summary disposition, the Licensee would have preferred a judgment on the pleadings alone. *Id.* at 9. As next best, the Licensee wanted us to put our questions in writing and order that the answers likewise be in writing. *Id.* at 7-8. The Licensee suggested that even if we decided to take oral testimony, we nonetheless use written questions — to avoid surprise and to limit the scope of the additional material to the question of whether a genuine issue existed about a material fact — and give the other parties an opportunity to examine the witnesses. *Id.* at 8.

The Intervenors responded on February 25 to the Licensee's motion for clarification or reconsideration. Noting the existence of federal court cases in which oral testimony had been taken on summary disposition motions, the Intervenors supported holding the prehearing conference we had proposed, on condition that testimony taken at it was limited to the question of whether a genuine issue existed, and that other parties were permitted to examine the witnesses. The Intervenors also said that

they should be given an opportunity after the conference to rebut elements of the Licensee's presentation.

The Staff responded to the Licensee's motion for clarification and reconsideration on March 6, 1985. The Staff argued that although no regulation explicitly permitted oral testimony on summary disposition, neither did any regulation explicitly prohibit such testimony, and that a licensing board did have the power to request additional information where it believed that the existing record was insufficient to allow summary disposition. Staff's Response to Licensee's Motion for Reconsideration at 3 (citing *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 752 (1977)).³ The Staff also pointed out that there had been other boards which had heard oral testimony on motions filed outside of a hearing. *Id.* at 3 n.2 (citing *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-756, 18 NRC 1340, 1343 (1983) (Appeal Board heard oral testimony and cross-examination on motion to reopen the record)).

The Staff agreed with the Licensee that caution had to be exercised, to "avoid a lengthy trial for the purpose of establishing that an actual trial is necessary." *Id.* at 4 (quoting 6 J. Moore, W. Taggart & J. Wicker, *Moore's Federal Practice*, ¶ 56.11[1.6]). The Staff even suggested that one proper course for us was simply to deny the motions for summary disposition, a solution we believed to be more in keeping with the letter of the law on the Licensee's burden of proof than with the spirit of the summary disposition rules, which seek to avoid needless litigation.

The Staff nonetheless saw that permitting only written additions to the record, as the Licensee had suggested, would "deprive the Board of an opportunity to pursue fully questions to determine whether there was a genuine issue of material fact." *Id.* at 6. The Staff echoed the other parties' call for an opportunity to examine the Licensee's witnesses, and the Intervenor's call for a later opportunity to rebut. *Id.*

On March 14, 1985, we affirmed by written order (unpublished) our intention to hold the prehearing conference, having determined that under federal court practice and NRC law we had a discretionary power to hear oral testimony on summary disposition motions. We declared unfounded the parties' concern that we would permit unfair surprise. We said that it was manifestly evident that if the Licensee was presented with an additional opportunity to meet its burden on the motions for

³ The Staff could have cited also 10 C.F.R. § 2.749(b), which empowers the board to "permit affidavits to be supplemented or opposed by deposition, answers to interrogatories or further affidavits," essentially the means the Licensee proposed of supplementing the record.

summary disposition through oral testimony, the other parties would be given an opportunity to respond or rebut. We also clarified what areas we were interested in pursuing and affirmed that oral testimony would be used solely to determine whether any genuine issues about material facts existed concerning Contentions (b) and (d).

The prehearing conference was held, as scheduled, on March 26, 1985. The Licensee's affiliates, Messrs. Parvin and Dzenis, and Licensee's witness Michael Y. Young, Manager of the Thermal Hydraulic Applications Group in the Nuclear Safety Department of Westinghouse Corporation, gave didactic presentations on computer modelings of the thermal-hydraulic behavior of the core during reflood after a LOCA, and on how the steam which is formed in primary coolant during normal operation behaves. Each affiliate then responded to issues the filings raised in his area of expertise, both the issues we had listed in our order establishing the conference and other issues of which the ones we had listed were examples.

About halfway through the conference, Intervenor's began to object to the procedure. Tr. 152. At the point of the Intervenor's objection, the Licensee had completed its didactic presentation on Contention (b), and its response to the issues Ms. Lorion's affidavit had raised in connection with Contention (b), and had just begun to respond to issues raised in Dr. Edwards' affidavit. Apparently, the immediate occasion of the Intervenor's objection was that the Licensee had responded to two issues raised by Dr. Edwards that we had not listed in our order establishing the conference (*see* Tr. 156), though they were, clearly enough, the sorts of issues of which the ones we had listed we had said were examples. *See* February 2, 1985 Order. However, as the Intervenor's explanation of their objection took shape, it was clear that the objection was quite broad. They charged that the prehearing conference in fact amounted to a hearing in which the evidence presented had been one-sided and had gone beyond the scope of *any* question the Board had proposed (Intervenor's April 18, 1985 Comment on Prehearing Procedure at 1 (emphasis supplied)), that the Utility had been in control, presenting evidence on the merits of the contentions, going down lists of the Intervenor's concerns, and providing no opportunity for cross-examination; the Intervenor's claimed that the Board should have been asking all the questions during the conference, and confining the answers to the general issue of whether a genuine issue existed about any material fact. Tr. 154-55.

The Intervenor's objections during the conference culminated in, first, a refusal to avail themselves of the opportunity we gave them, as promised, to cross-examine the Licensee's witnesses (Tr. 170-71), and,

then, in a motion to strike *all* the testimony offered at the conference, whether didactic or not, and whether in response to the issues we had explicitly raised or not. Tr. 207-08. The Intervenor also asserted that only if we denied their motion to strike would they avail themselves of the opportunity we had promised them to rebut the testimony given at the conference. Tr. 212. They claimed that either to cross-examine or rebut during the conference was inappropriate, for it only contributed to turning the conference into an evidentiary hearing. Tr. 171, 203.

We denied the Intervenor's motion to strike the testimony received in the prehearing conference. Tr. 214. We were convinced that there had been no significant departure from the original aim of the prehearing conference, and no defect in fairness toward any party. In retrospect, we could see that some of the testimony appeared to go to the merits, rather than merely to the question of whether a genuine issue existed, and we have pointed out such testimony in our ruling on Contention (b). But we see here nothing which warrants the Intervenor's quite broad motion to strike. Less all-encompassing motions might have been appropriate. Apparently, however, the Intervenor did not want to make such discriminating motions. At no time have they pointed out what portions of the testimony they thought spoke to the merits, and, indeed, they appeared to be confident in our ability to discern such portions, for, despite their motion to strike, they proposed that "the Board take judicial notice and consider in an informal way this presentation by the Licensee; but that this testimony not come in for its truth. . . . But make no mistake about it, we ask it all be stricken." Tr. at 207-08.

We gave the parties fair warning about the issues we wanted treated in the conference: we listed several in the original order establishing the conference, calling them examples; we made clear both in that order and in the order affirming our decision to hold the conference that we were asking the Licensee to be prepared to respond didactically to all the issues raised in the Intervenor's affidavits, not just the few we had listed by page or paragraph number in the earlier order. We made equally clear, both before and during the conference, that the Staff and the Intervenor could cross-examine and rebut the Licensee's testimony. Tr. 170-71, 202-03. Indeed, we gave the Intervenor 3 weeks in which to respond to that testimony (Tr. 215) and made sure they understood the risk they ran if they did not respond. Tr. 202-03. By a filing dated April 18, 2 days after the end of the 3 weeks, the Intervenor announced that they would "not further dignify the procedure by submitting rebuttal or other testimony." In the same filing, they also asserted that "the net effect of the Prehearing Conference has been to firmly establish that

there are substantial disputed issues of material fact at issue regarding both Contentions (b) and (d)." Which issues they did not say.

STANDARDS FOR SUMMARY DISPOSITION

By and large, licensing boards, when considering motions for summary disposition under 10 C.F.R. § 2.749, will apply the standards established by the courts for considering motions for summary judgment under Rule 56 of the Federal Rules of Civil Procedure. *Alabama Power Co.* (Joseph M. Farley Nuclear Plant, Units 1 and 2), ALAB-182, 7 AEC 210, 217 (1974). Summary disposition is available in hearings on amendments to licenses. *Boston Edison Co.* (Pilgrim Nuclear Station, Unit 1), ALAB-191, 7 AEC 417 (1974). A motion for summary disposition will be granted when the record shows that there is no genuine issue as to any material fact, and that the moving party is entitled to a favorable decision as a matter of law. 10 C.F.R. § 2.749(d). The record must be viewed in the light most favorable to the party opposing the motion. See *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), LBP-74-36, 7 AEC 877, 897 (1974) (citing federal court cases). The failure of the party opposing summary disposition to submit evidence against the disposition does not require that the motion be granted. The movant must still meet his burden of proof to establish the absence of any genuine issue of material fact. *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 753-54 (1977).

CONTENTION (b)

Paraphrased without technical language, the Intervenor's Contention (b) says that the computer model used to make the most recent prediction of the temperature of the hottest spot on the hottest rod in the core after a loss-of-coolant accident (LOCA) during reflood of the core doesn't meet the NRC regulations applicable to such models, that, in particular, the model does not adequately consider the effect even a slight decrease in the rate of reflooding can have on the temperature of the hottest spot in the core.

Certain aspects of the actual text of the contention, and of the Intervenor's response to the motion for summary disposition of the contention, will be clearer if we first set out some technical matters.

General Design Criterion 10 (GDC 10) requires that

[t]he reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

10 C.F.R. Part 50, Appendix A.

The "fuel design limit" relevant under this contention is the temperature at which the integrity of the cladding of the fuel is seriously threatened. The "anticipated operational occurrence" relevant under this contention is a LOCA. The "appropriate margin" GDC 10 calls for in this case is established by 10 C.F.R. § 50.46(b)(1), "*Peak cladding temperature* [PCT]. The calculated maximum fuel element cladding temperature shall not exceed 2200°F." The PCT is not to be an average drawn from all the peaks on all the rods in the core, or even from all the peaks on a single rod. Rather the PCT is to be the temperature of the hottest region on the hottest rod in the core after a LOCA. 39 Fed. Reg. 1001 (Jan. 4, 1974). The cladding of the fuel in Units 3 and 4 at Turkey Point does not become embrittled until its temperature is somewhere between 2500° and 2700°F. Tr. 132-33. Thus the 2200°F limit established by § 50.46(b)(1) entails a safety margin of at least somewhere between 300° and 500°.

Before the amendments which are at issue in this proceeding could be issued, the Licensee had to show that the PCT in Units 3 and 4 under the operating limits to be imposed by the amendments would not exceed 2200°F. Usually a calculation of a PCT requires the use of several models, each one specializing in a different aspect of the behavior of core and coolant after a LOCA. One model will calculate the rate at which the emergency core cooling system refloods the core; another model, with reflood rates as input, will calculate certain numerical variables which specify heat transfer from the rods to steam from the water flowing in from the emergency core cooling system (ECCS). Yet another model will use these heat transfer coefficients as input for calculations of PCTs. The NRC requires that these models conform to the criteria in Appendix K of 10 C.F.R. Part 50. 10 C.F.R. § 50.46(a)(1).

The Licensee used two models to calculate heat transfer coefficients. The oldest of the two, the Full Length Emergency Cooling Heat Transfer (FLECHT) was accepted for use by the NRC at least as early as 1974. See 39 Fed. Reg. 1003 (Jan. 4, 1974). FLECHT is simply an equation which expresses a correlation of data points determined by experiment. The other model, "BART-A1: Computer Code for the Best Estimate Analysis of Reflood Transients" (BART), relies on principles of engineering rather than correlations based solely on experiment. Tr. 111-13.

On December 21, 1983, the NRC Staff accepted BART as being in conformity with Appendix K when applied under certain conditions, which included, most important among others, a certain range of operation of the core, a maximum on the distance between cladding points modeled, and a prohibition against the use of a grid-spacer model as part of the BART model. See Staff's Safety Evaluation Report on BART (BART SER), Dec. 21, 1983, at 16. The range of operation of the core was generous enough to include even the possibility of blockage of reflood by swollen or ruptured cladding. *Id.* at 9-10, 14-15. The Staff judged that the accuracy of the grid spacer model was not yet established. *Id.* at 9. Inclusion of the model would probably have lowered the calculated PCT, because the grid spacers can be expected to contribute to the transfer of heat from the core to the coolant. *Id.*

Applied under the conditions imposed by the Staff, BART, in conjunction with several other models — most particularly LOCTA, which performs the actual calculation of the PCT — yielded a predicted PCT of 1972°F, 228° under the regulatory limit of 2200°F. Parvin Affidavit, ¶ 5.

The Licensee revised the prediction upward to 2051°F when it was discovered that there existed a less-than-adequate connection between BART and the model which predicted the rates of reflood of the core. That rate varies, though not widely. Thus, a curve which charted that rate as a function of time would be gently rolling. The area under the curve would represent the total amount of water which had entered the core from the ECCS. However, a curve constructed from a small sample of points on the complete curve could miss some of the low points on the complete curve and thus, by overestimating the amount of water in the core, overestimate the amount of steam available for cooling, and, in turn, underestimate the PCT. Letter from E.P. Rahe (Westinghouse) to D.G. Eisenhut (NRC), March 22, 1985.

The Licensee has strengthened the connection between BART and the model which calculates reflood rates, WREFLOOD, so that the input to BART on rates of reflood matches the information available from WREFLOOD on rate of reflood, and so that the total amount of coolant in the core as calculated by BART from rate information equals the total amount of coolant as calculated by WREFLOOD. *Id.* The Staff has reviewed the Licensee's modifications and has revised accordingly its safety evaluations of the BART model and the amendments at issue here, but concludes anew that the BART model meets the criteria of Ap-

pendix K.⁴ Board Notification BN-85-055, May 16, 1985. This revision is the principal subject of the Intervenor's motion for suspension of the license amendments and will be considered by us again when we rule on that motion.

Sometime in 1983, the Staff asked the Licensee to calculate the PCT for Units 3 and 4 by using the older model of heat transfer coefficients, FLECHT. Staff Safety Evaluation Report on Amendment 99 to DPR-31 and Amendment 93 to DPR-41 (SER on amendments), May 14, 1985, at 5-6. The Licensee did so, and on December 17, 1983, submitted for Staff review a FLECHT-based PCT of 2130°F, higher than the modified BART figure, but still under the regulatory limit of 2200°F. *Id.* at 6. Thus, although the figure calculated using BART was sufficient to meet the 2200°F limit, it was not necessary. The Licensee could have met the limit using FLECHT alone. This fact is crucial to our disposition of the motion for summary disposition of this contention.

One small, short-term adjustment has had to be made in these two figures, the 2051°F predicted with BART and the 2130°F predicted with FLECHT. The Licensee's principal way of preventing embrittlement of the reactor vessel by neutron bombardment has been to replace part of the low-parasitic (LOPAR) fuel in the core with optimized fuel assembly (OFA) regions at each reloading of the core. Eventually the cores in Units 3 and 4 will consist wholly of OFA fuel, but for the next few years, the cores will contain a mixture of the two kinds of fuel. The PCTs calculated with BART and FLECHT are applicable to either kind of fuel, but not, without adjustment, to a core containing a mixture of the two.

⁴ By letter dated March 18, counsel for the Licensee informed us that on March 9 Westinghouse had discovered, in work unrelated to Units 3 and 4, that shortcomings in the procedures for transferring information from WREFLOOD to BART would entail an increase in the PCT predicted with BART. The Licensee's letter to us only briefly described the shortcomings in the procedures and could say about the revised PCT only that it would be less than the 2200°F limit imposed by regulation. On March 22, Westinghouse gave the Staff a full account of the shortcomings in the procedures and of how the shortcomings had been corrected, and reported that the revised PCT was 2051°F, to which, again, 10°F was to be added during the period of transition between fuel types. During the prehearing conference on summary disposition, Westinghouse witnesses largely repeated what Westinghouse had told the Staff on March 22. Tr. 124-30. The Staff volunteered that it would be appropriate for the Staff to provide the Board and the parties with its review of the information given it by Westinghouse, and we ordered that the Staff do so within 2 weeks of the conference. Tr. 204-05, 218-19. On April 10 the Staff submitted an affidavit from Summer B. Sun, whose qualifications we have noted, and Norman Lauben. Mr. Lauben is a Section Leader in the Reactor Systems Branch of the Division of Systems Integration of the NRC. He supervises the review of transient and accident analyses and analytical methods submitted by vendors and utilities. The affidavit reviewed the information Westinghouse had given the Staff on March 22, the related testimony the Westinghouse witnesses gave at the prehearing conference, and the affidavit Mr. Sun had submitted in response to the Licensee's motion for summary disposition of Contention (b). On May 16, 1985, in Board Notification BN-85-055, the Staff provided us with the revised safety evaluations of BART and the amendments at issue here.

Experimental work on full-size fuel assemblies of OFA fuel have shown that the OFA fuel causes a 4.5% greater resistance to the passage of fluids than does the LOPAR fuel. Tr. 115. This increased resistance, called hydraulic resistance, can affect the efficiency with which steam from the water flowing into the core after a LOCA cools the core. Engineering equations applied to the 4.5% figure for the increase in hydraulic resistance show that the velocity of steam going past a single OFA fuel rod surrounded by LOPAR fuel is reduced by 2.2% from what it would be were it surrounded by OFA fuel. Tr. 116. The reduction comes about because steam, following the path of least resistance, crosses over from the single OFA element to the LOPAR fuel, where the hydraulic resistance is less. Tr. 115. No single OFA fuel rod in Units 3 and 4 Turkey Point will be surrounded by LOPAR elements at any time during the transition between the two kinds of fuel, but on the conservative assumption that every OFA rod in Units 3 and 4 is surrounded by LOPAR rods, as was assumed in calculating the 2.2% reduction in velocity (Tr. 117, 123-24), then the predicted PCT for Units 3 and 4 must be increased by not more than 10°F. Parvin Affidavit, ¶ 5.

This 10°F was calculated in the following way: mathematical modeling of a three-loop plant like Units 3 and 4 shows that a 5% reduction in the velocity of steam during reflood entails an increase in the PCT of not more than 19°F. Tr. 116. A 2.2% reduction, therefore, entails a proportionately smaller increase in the PCT, namely, 8.4°F, which the Licensee and the Staff are treating as 10°F. Tr. 116-17. This increase applies to both the PCT as predicted with BART, and the PCT as predicted with FLECHT, despite the difference in the two predictions, for the 10°F is derived by simple proportion from the ratio of 5% to 19°F, and thus does not depend upon the temperature to which it is being added.

Therefore, for the period of the transition between types of fuel, the PCT predicted with BART is 2051°F + 10°F, or 2061°F, and the PCT predicted with FLECHT is 2130°F + 10°F, or 2140°F. Both predictions fall within the limit set out in 10 C.F.R. § 50.46(b)(1).

Now we have set out sufficient technical and regulatory background for understanding the contention and the Intervenor's response to the motion for summary disposition. The contention is as follows:

Whether the entirely new computer model used by the utility, for calculating re-flood portions of accidents meets the Commission's ECCS Acceptance Criteria, specifically, whether a 2.2% reduction in re-flood rate is misleading because for a small decrease in re-flood rate, there results a large increase in fuel temperature. Re-flood rates are critical if below 1 or 2 inches per minutes.

It will be immediately seen that the contention was drafted without a full picture of BART's uses, or the meaning of the 2.2% reduction. The contention thus contains certain errors of fact which render it incapable of raising any genuine issue of fact.

First, there is no basis for the claim in the contention that BART is "entirely new." Of course, BART is in some sense new, but many of its parts are old. The Staff repeatedly says in its safety evaluation of BART that this or that submodel within BART is "conventional," or "typical." See, e.g., §§ 2.1, 2.2.2, 2.4.⁵

Second, and more important, the 2.2% reduction is not in the rate of reflood, but in the velocity of steam passing by OFA fuel assemblies; it is a reduction only for the relatively short period of the transition from one fuel type to another; and BART had nothing to do with calculating either the 2.2% or the 10°F increase the 2.2% entails in the PCTs predicted with the aid of BART and FLECHT. As we reported, the 2.2% is the result of experiment and calculation exclusive of BART, and the 10°F follows from a simple proportion. Thus, insofar as one specific concern of the contention is that BART may not be taking adequate account of the 2.2% reduction, the concern is misplaced, for not only is the reduction not in reflood, neither BART nor FLECHT should take into account the reduction. The Intervenor has taken no issue with the way in which either the 2.2% or the 10°F was derived.

Last, and most important, the contention says nothing about the fact that the Licensee used FLECHT to predict a PCT that falls within the 2200°F established by § 50.46(b)(1). Dr. Edwards, in his affidavit in response to the motion for summary disposition, does mention FLECHT, not to argue any defect in FLECHT itself, though, but rather to argue that, given the uncertainties of mathematical modeling, it is a matter of political judgment whether the 2140°F predicted with the help of FLECHT, and adjusted for the transition core, can be said to fall within the 2200°F limit. Edwards Affidavit at 7, ¶ 9(e). Both the Staff and the Licensee construe Dr. Edwards' argument to be, in effect, an attack on the 2200°F limit (Licensee's Motion to Strike at 10-11; Staff's Response to Licensee's Motion to Strike at 9-10); but, construing the argument in the most favorable light, we view it as kin to a question we asked during the prehearing conference on March 26: whether the figures the models had predicted for the PCTs were significant to the four places being quoted us, or rather whether the 2130°F, for instance, ought to be rounded off to 2200°F. Tr. 130. More generally, we asked whether there

⁵ The language of the contention is general enough to permit one to think that the drafter thought that BART, all by itself, modeled reflood. As we have noted above, it does not.

was an error band of so many percent associated with the predicted PCTs. Tr. 131-32. The reply was that the models provide four figures, that the Staff required that the predictions be rounded off to the nearest 10°F, and that the figures we were shown were upper bounds, that realistic estimates would be lower. *Id.* The Intervenor has not seen fit to raise any doubts about this reply to our questions, and ourselves seeing no doubt to be raised, we must conclude that the Intervenor has raised no genuine issue about FLECHT, or about whether the PCT predicted with FLECHT meets the 2200°F standard.

Therefore, whatever may be the Intervenor's concerns about the adequacy of BART, as long as the Licensee has met the standard in § 50.46(b)(1) using a heat transfer correlation which the Staff has long accepted, and whose conformity to the criteria in Appendix K of Part 50 is not in dispute in this proceeding, we are obliged to grant the Licensee's motion for summary disposition of Contention (b).

We are left then with the Intervenor's criticisms of BART. Before the legal significance of the Licensee's having used FLECHT was clear to us, the concerns the Intervenor had raised about BART seemed to us to be the most important aspect of the litigation of the contention, and it was largely to find out whether these concerns raised any genuine issues about material facts that we asked the Licensee to make a didactic presentation on March 26. Therefore, it is fitting that, rather than dismiss the Intervenor's concerns simply with the observation that the Licensee has complied with the relevant legal standards, we make brief comments about the chief of these concerns.

Some of the Intervenor's comments about BART are simply general cautions about the uncertainties of computer modeling. *See, e.g.,* Edwards Affidavit at 4, ¶ 7. We have taken note of those cautions and shall not further address them. Of the more than a dozen specific comments, most either misrepresent facts, or expect BART to do what only other codes or equations are to do, or seek to have imposed on BART burdens not imposed by law. A few of the claims appear to raise genuine issues, especially if we apply the rule that the record and affidavits are to be viewed in the light most favorable to the party opposing the motion. But since the Licensee has used FLECHT to predict a PCT which complies with the standard in § 50.46(b)(1), the few issues raised are not material and therefore do not justify the holding of an evidentiary hearing. We begin with those comments which raise no genuine issue.

1. "[T]he small break LOCA analysis did not give much weight to the mixed fuel core." Lorion Affidavit at 4; *see also id.* at 5, item "e."

Most of the Intervenor's attempts to raise genuine issues paraphrase or quote from the Staff's safety evaluation of BART, and this attempt quoted above purports to have the same source. However, the Intervenor's affiants never cite the Staff's evaluation by page, and we have been unable to find what Ms. Lorion is paraphrasing or quoting in the sentence above. Whatever her source, it is the task not of BART, but of other codes, to do small-break LOCA analysis. Tr. 135; SER on Amendments, § 4.3. Moreover, we do not know quite what "much weight" might mean here, nor why it is important that the small-break analysis did not give much weight to the mixed core.

2. "BART does not have a gap heat transfer model or cladding swelling model as required by Appendix K." Lorion Affidavit at 4; *see also* Edwards Affidavit at 6-7.

This sentence is simply a quotation from § 3.0 of the Staff's SER on BART at 13. As the sentence says, Appendix K requires both a gap heat transfer model and a cladding swelling model. *See* 10 C.F.R. Part 50, Appendix K, §§ A.1 and B. But the Appendix does not require that BART contain these models. They are, in fact, contained in LOCTA, the model which makes the ultimate calculations of PCTs. Tr. 135. Moreover, BART does reckon with the consequences of flow blockage caused by cladding swelling, bowing, and other phenomena. Tr. 159-60. Dr. Edwards implies, without citation to any document, that BART deals with such phenomena "simply by assigning a 'numerical penalty.'" Edwards Affidavit at 7. The Licensee, however, reports that the penalty is calculated. Tr. 160-61.

3. "BART was accepted without a grid spacer model because it was still being reviewed by the NRC staff." Lorion Affidavit at 4.

As we reported above, it was the Staff's judgment that the accuracy of the grid spacer model for OFA fuel had not been established, and that therefore the grid spacer model should, for the time being, not be included in BART. However, as we also reported above, this exclusion only makes BART more conservative since the grid spacers increase the transfer of heat away from the rods. *See* BART SER § 2.6. The Licensee's predicted PCTs are doubly conservative, in fact, for they do take account of the grid spacers in one way: Those spacers are largely responsible for the 4.5% increase in hydraulic resistance during the transi-

tion between fuel types, an increase which entails a 10°F increase in the PCTs for the transition. Thus the PCTs for the transition reflect a penalty for the increased hydraulic resistance caused by the grid spacers, but the PCTs do not reflect a credit for the increased heat transfer caused by the spacers. Tr. 137-38.

4. "The Flecht Seasta [sic: FLECHT-SEASET] data comparison were [sic] from a series of tests conducted on fuel rods in a 17 x 17 assembly and extrapolated to a 15 x 15 assembly." Lorion Affidavit at 4.

Part of this sentence is drawn from § 2.7.4 of the BART SER. That section says nothing about "extrapolation," a word more appropriate to prediction than to data comparison. The FLECHT-SEASET data were not used by BART to predict heat transfer coefficients for a 15 x 15 assembly. Rather, BART's results for a 15 x 15 assembly were compared to the FLECHT-SEASET results for a 17 x 17 assembly. BART's results were also compared to other test results for 17 x 17 assemblies. See BART SER § 2.7.2. The Intervenor's do not say why such comparisons should not be made, or why, among the comparisons made with results for 17 x 17 assemblies, they chose to single out the comparisons with the FLECHT-SEASET data. We note that the BART results were also compared with FLECHT data for 15 x 15 assemblies. See BART SER § 2.7.1 at 10; *see also* Tr. 141.

The following concerns of the Intervenor's are not drawn, as far as we can tell, from the Staff's SER on BART.

5. "BART does not address or compute the probability that steam generator tube failure and steam binding could stall the reflood." Lorion Affidavit at 5.
6. "BART does not compute the possibility or consequences of gross pressure vessel rupture." *Id.*
7. "BART does not take into account the aging to the system and components at Turkey Point." *Id.*

The Licensee reports that its predictions of PCTs do in fact account for steam binding, but that — and we agree — Appendix K, which sets the standards for evaluation models of the phenomena which determine PCTs, does not require that such models take into account the other factors mentioned in the three sentences quoted above.

8. "BART has not conducted actual experiments on a mixed transitional fuel core, and instead adopts a purely hypothetical percentage for thermal hydraulic resistance." Lorion Affidavit at 5; *see also* Edwards Affidavit at 6, ¶ 9(b).

The truth is somewhere between the two extremes the Intervenor set out: No experiments have been done on the mixed transitional core, but the percentage increase in hydraulic resistance is not therefore "purely hypothetical." As we explained above, the 4.5% figure for increase was established by experiment, the 2.2% figure for reduction in steam flow velocity this increased resistance causes was established by engineering equations, and the 10°F figure for increase in the PCTs was established by a simple proportion. BART had no part to play in establishing this 10°F.

The Intervenor's remaining comments on BART appear to raise genuine issues, at least when the record and the affidavits are read in the light most favorable to the Intervenor. However, as we said, the facts about which these issues have been raised are not material, given the Licensee's use of FLECHT to comply with the regulation on PCT.

9. Again, quoting the Staff SER without citation to a page, Intervenor Lorion says, "[t]he assumption of constant pressure made in BART may preclude consideration of the oscillating antigravity reflood phenomena." Lorion Affidavit at 4, 5 (*quoting* Staff BART SER at 3, § 2.1). Dr. Edwards adds, likewise quoting without citation, that BART does not "encompass all possible expected flow patterns" even if the system pressure is relatively constant. Edwards Affidavit at 6, ¶ 9(c) (*quoting* Staff BART SER at 3, § 2.1).

The Licensee's response to the comments on the assumption of constant pressure is not clear, but seems to be either that another computer code, WREFLOOD, takes variations in pressure into account (*see* Tr. 139-40, 158), or that BART's assumption of constant pressure is, for various reasons, reasonable. *See* Tr. 140-41. This last alternative goes to the merits rather than to whether the Intervenor has raised a genuine issue. To Dr. Edwards' report of the Staff's comment about BART's incomplete coverage of expected flow patterns, the Licensee replies merely that, in comparisons with FLECHT, BART has proved to be conservative. Tr. 158-59. This reply, rather than showing that the Intervenor raises no issue, avoids the issue they raise.

10. "Only one single test was performed in the BART topical as a basis for parameter assessment." Lorion Affidavit at 4 (paraphrasing Staff BART SER at 5, § 2.2.3).

Again the Licensee replies merely that BART has proved to be conservative in relation to FLECHT. Tr. 138-49.

11. "The BART code shows spikes in the calculated results of the heat transfer coefficients. The spikes are indicative of the discontinuous heat transfer regime transitions. However, the overall BART predictions are in good agreement with the heat transfer coefficient data." Of course, it is precisely where the "discontinuous heat transfer regime transitions" occur that cladding failure is likely to occur. Cladding failure generally begins as a local phenomenon, not necessarily as an "overall" phenomenon. Edwards Affidavit at 7, ¶ 9(g) (quoting the Staff SER at 10-11).

It is not clear from the Staff's SER on BART whether these spikes are a product of a discontinuity which actually would exist in the fuel assemblies during reflood, or a discontinuity which exists only in the model. Since BART uses only three heat transfer regimes (see BART SER at 3), there may be more discontinuity between them than there would be between the more numerous regimes in the actual fuel assemblies during reflood. Whatever may be the case, the Licensee replies that, because of the "thermal inertia" of the fuel rods, the spikes have little effect on the PCT predicted with the help of BART, and that even assuming these spikes could cause cladding failure, such failure is taken into account in the BART model. Tr. 165-66. The Licensee adds that, in the event of cladding failure, it is the average temperature in the hot assembly that matters, not the local temperature. Tr. 166. The Licensee thus implies that the model's "overall" agreement with the heat transfer coefficient data is sufficient. This reply appears to go to the merits.

THE INTERVENORS' MOTION TO SUSPEND OR REVOKE THE LICENSE AMENDMENTS

As we have reported, on March 18, 1985, Counsel for the Licensee informed the Board by letter that because of shortcomings in the procedures for transferring information from WREFLOOD to BART, the PCT predicted with BART would have to be revised upward. In our discussion of Contention (b) we dealt fully with this revised PCT, but must briefly consider it again now in another procedural context.

Toward the beginning of the March 26, 1985 prehearing conference on the summary disposition motions, the Intervenor delivered to the Board and the parties "Intervenor's Motion to Suspend or Revoke the License Amendments." Tr. 93-96. The heart of the motion was the claim that the Licensee's March 18 letter — which did not describe the shortcomings in the WREFLOOD-BART link, or say what the revised PCT would be, but only that it would be less than the 2200°F limit imposed by 10 C.F.R. § 50.46(b)(1) — showed that there was "no valid technical basis for the WREFLOOD-BART computer model," and that there was therefore "no valid legal, technical, or mathematical basis for operation of the Turkey Point nuclear power plants under the subject license amendments." Motion to Suspend at 1, 3. The Intervenor concluded that

the Board must now suspend or revoke these license amendments, with the requirement that the Licensee . . . operate the facility in accordance with the original technical specifications . . . until this board has determined that there exists a computer model that allows operation of the plant within the requirements of 10 C.F.R. 50.46 and 10 C.F.R. Part 50 Appendix K.

Id. at 2. The motion was accompanied by the same two affidavits which accompanied the Intervenor's response to the motions for summary dispositions. Of course, since these affidavits were written before the Licensee's counsel had informed us of the revision in the PCT, they could not support the Intervenor's claim in their motion that the Licensee's March 18 letter showed that the "WREFLOOD-BART computer model" had no valid technical basis. Neither did the motion contain any legal discussion of our authority to suspend or revoke amendments to an operating license.

At the prehearing conference on summary disposition, the Licensee gave the Board and the parties the new figure for the PCT calculated after the shortcomings in the procedure for transferring information from WREFLOOD to BART had been corrected. Tr. 124. The Licensee also explained what those shortcomings had been and how they had been corrected. Tr. 125-30. Later in the conference, on the basis of this new information, the Intervenor withdrew the motion to suspend or revoke the amendments. Tr. 216. Apparently, for the Intervenor, the mere specificity of the revised PCT was enough to put "a valid technical basis" under BART. Intervenor's counsel said, "I think that [the revised PCT] puts the BART model back into the realm of certainty, whereas there was no certainty at the time we filed the motion." *Id.*

Later in the conference, however, the Intervenor reinstated their motion, arguing that the Licensee's testimony on the circumstances sur-

rounding the revision in the PCT had not been full enough, that "all we have today is [Licensee's March 18, 1985] letter saying those original values are no longer accurate." Tr. 219-22. As we have noted, we also had the Licensee's witnesses' testimony about the revision in the PCT.

As we have described in our discussion of Contention (b), the Licensee had in fact even before the prehearing conference given the Staff a fuller account of the revision of the PCT. After the conference the Staff reviewed the account and revised its safety evaluations of both BART and the amendments accordingly. The Intervenor's have not amended their motion to take into account either the testimony at the prehearing conference, or any of the further filings by the Licensee and the Staff.

The Licensee and the Staff filed in opposition to the Intervenor's motion to suspend or revoke on April 4 and April 10, 1985, respectively. The Staff's filing was accompanied by an affidavit.⁶ Neither the Staff nor the Licensee saw any merit in the Intervenor's claim that the upward revision in the PCT meant that the BART code had no valid technical basis, but the Staff and the Licensee disagreed on whether we had the authority to suspend or revoke the amendments. The Licensee argued that the Intervenor's should have filed a petition for suspension or revocation under 10 C.F.R. § 2.206 with the Director of the Office of Nuclear Reactor Regulation. The Staff argued that in amendment proceedings in which the Board will, in its initial decision, rule on the issue raised by the motion to suspend or revoke, suspension or revocation by the Board could be analogized to a temporary restraining order issued by a federal court, and could be based on the factors for stays of decisions (see 10 C.F.R. § 2.788(e)).

However, we need not reach the question of whether we have the authority to suspend or revoke the license amendments,⁷ since, as is clear from our discussion of Contention (b), the Intervenor's motion is without substantive merit and must be denied. Whatever the shortcomings of BART may be — and the Intervenor's motion, being wholly unresponsive to the Staff's and the Licensee's filings on the revised PCT pre-

⁶ This was the same affidavit which accompanied the Staff's filing on the revision of the PCT. As we noted in our discussion of Contention (b), that latter filing also was on April 10.

⁷ We simply note that the Staff's position on a Board's authority has at least this advantage, that it is consistent with a recognition that in an amendment proceeding, in contrast to construction permit or operating license proceedings, the *status quo* is not necessarily benign in relation to public health and safety, and that the Board presiding over an amendment proceeding in which the issues raised by the motion to suspend or revoke are already issues in the amendment proceeding is likely to know more than any other Commission officer knows about the issues. Both the cases the Licensee cites in support of its claim that we would not have the authority to suspend or revoke the amendments involve construction permits, and in neither case did the Board have already in the ongoing proceeding jurisdiction over the substantive issues raised by the Intervenor's filings, neither one of which was a motion to suspend or revoke.

dicted with BART, cannot possibly point to any shortcoming — BART is irrelevant to the resolution of either the Intervenor's motion to suspend or revoke, or the Licensee's motion for summary disposition of Contention (b), for, without using BART, the Licensee has met the legal requirements imposed on predicted PCTs.

Accordingly, Licensee's motion for summary disposition of Intervenor's Contention (b) is granted.

CONTENTION (d)

This contention, like Contention (b), is concerned with the effects of running the fuel in Units 3 and 4 at higher temperatures, principally with whether the integrity of the cladding of the fuel would be maintained at certain times. Contention (b) focuses on the integrity of the cladding during reflood of the core after a LOCA; Contention (d) focuses on the integrity of the cladding during normal operation and certain abnormal occurrences other than LOCAs.

In lay terms, the contention says that the license amendments in issue here make it significantly more probable that the temperature of the cores in Units 3 and 4 will reach the point where the fuel rods will become, in effect, insulated by films of steam, and thus will retain heat that would otherwise be transferred to the water flowing by the rods. The rods thus insulated, the cladding of the fuel is significantly more likely to fail. Moreover, the contention continues, failure of the cladding would release fission products into the coolant and thus make it more likely that there would be serious consequences from an accident.

The text of the contention, and the parties' arguments on summary disposition, cannot be understood without some explanation of how steam behaves during the normal operation of a pressurized water reactor. If the temperature of the fuel in the core of a PWR is high enough, but not too high, bubbles of steam will form on the surfaces of the fuel rods, and will be swept away from the rods by the flow of the coolant. Once in that flow, the bubbles will either condense and thus disappear, or, at some higher temperature, survive in equilibrium with the liquid coolant. The stage of boiling at which the bubbles form and leave the surfaces of the rods is called nucleate boiling. During nucleate boiling, the transfer of heat from the surfaces of the rods to the coolant is efficient and increases more or less in proportion to the increase in the temperature of the rods. The conventional numerical measure of the heat transferred in a given time from a given surface is called "heat flux." See generally Dzenis Affidavit at 3-4.

If the temperatures of operation are high enough, however, some bubbles of steam will remain on the surfaces of the rods, and on each rod adjacent bubbles will coalesce and thus begin to form a film of steam over the surface of the rod. The beginning of the formation of such films marks the beginning of what is conventionally called departure from nucleate boiling (DNB). Such films in effect insulate the rods, causing heat that would be lost to water at the surfaces of the rods to be retained in the rods. Thus, at whatever temperature films of steam begin to form on the rods, heat flux begins to decline. The heat flux at the beginning of this decline is called the critical heat flux (CHF). With the reduction in heat flux, a vicious circle forms, increasing the probability of failure of the cladding: Heat is trapped by the films, the temperature of the rods therefore increases, the films grow even larger, heat flux declines even further, more heat is trapped, and so forth. The heat flux from a given rod increases again only when the rod is completely covered by a film of steam, at which point, any further increase in the temperature of the rod increases the difference between the temperature of rod and the temperature of the liquid coolant on the other side of the film, and thus increases the amount of heat the film conducts. *See generally id.* at 4-5.

It is a long way, however, from DNB to a release of significant amounts of fission products to the environment. DNB does not necessarily lead to a breach in the cladding, and even if a breach were to occur, the fission products inside the cladding would be released only into the primary coolant system, which is itself a closed system. Nonetheless, prudence requires avoiding even the first step toward a significant release to the environment. Thus, during the operation of a reactor there must be some proper proportion kept between what the critical heat flux would be for a given set of operating conditions and what the actual heat flux (AHF) is under those same conditions.

It is, however, not possible to say with a high level of certainty what the CHF for a given kind of fuel, operating under a given set of conditions, in a given kind of reactor, would be. Different experimentally derived correlations between CHF and these other features afford different degrees of assurance about the CHFs they help predict. The choice of a proper proportion for a given core must be made, therefore, in the face of uncertainty. The choice can, nonetheless, be made prudently, and the NRC generally imposes on its applicants and licensees the following statistical measure of prudence: For a given plant, with a given kind of fuel, and a given set of operating conditions, the minimum ratio between CHF and AHF — called the minimum departure from nucleate boiling ratio (DNBR) — must afford at least a 95% confidence level that there

is a 95% probability that DNB will not be reached on the hottest rod in the core during either normal operation or certain abnormal occurrences other than LOCAs.⁸ This statistical measure of the prudence in the choice of a minimum DNBR, a measure we shall often call the 95/95 condition, is set out by the NRC Staff in its Standard Review Plan (SRP), NUREG-0800 at 4.4-2 to 4.4-3 (July 1981). The SRP is intended largely for the guidance of the Staff in its exercise of its licensing duties, and therefore does not have the status in law of Title Ten of the *Code of Federal Regulations*, which was the source of the regulation which guided our ruling on Contention (b). An applicant or a licensee need not conform with the standards set out in the SRP, if the applicant or licensee can persuade the Staff that it is conforming to a better standard, or even one just as good. *See id.* at 4.4-8. However, no party to this proceeding has argued that there is any defect in the 95/95 standard.

The license amendments at issue here impose a different minimum DNBR on each of the two kinds of fuel in Units 3 and 4. The difference between the two minimum DNBRs is a result of the differences between the ways the CHF's in the DNBRs were predicted. For the fuel which is being phased out in Units 3 and 4, the LOPAR fuel, the minimum acceptable DNBR is 1.3. *Hsui Affidavit* at 2; *Dzenis Affidavit*, ¶ 22. That is, operating conditions in those units must be chosen so that the predicted CHF's for the LOPAR fuel in those units is at least 30% greater than the corresponding AHF's for that fuel. The 30% reflects the uncertainty with which CHF's can be predicted for the LOPAR in those units. The prediction is accomplished using a correlation between CHF and operating conditions called the L-grid correlation, which Westinghouse established on the basis of an early set of experiments with coolant flowing inside isolated heated tubes, and a later set of experiments with coolant flowing in the channels between rods in rod bundles. *Tr.* 176-79. This L-grid correlation is used in analyses which model the operation of the reactor and yield predicted CHF's for various sets of operating conditions. These predicted CHF's vary enough from the CHF's measured in the experiments which established the L-grid correlation, that the predicted CHF's for LOPAR fuel must be at least 30% higher than the AHF's for that fuel, in order to achieve a 95% confidence that there is a 95% probability that DNB will not occur during either normal operation or certain abnormal occurrences other than LOCAs. *Dzenis Affidavit* at 8-9.

⁸ That is, there must be only a 5% chance that the probability that DNB won't be reached is less than 95%.

For the fuel which is being phased into Units 3 and 4, the OFA fuel, the minimum acceptable DNBR the amendments in issue here are imposing is 1.17, less than the DNBR being imposed on operations with the LOPAR fuel. Hsii Affidavit at 2. If the predicted CHF of the OFA fuel in those units is always at least 17% greater than the AHF for that fuel, then the 95/95 standard is satisfied. The 17% reflects the greater assurance with which the CHF of OFA fuel can be predicted. This greater assurance comes from the use of a correlation called the WRB-1, developed by Westinghouse in an extensive program of experiments with the flow of cooling water through arrays of heated rods. The experiments more closely simulated the geometries and conditions of operating PWRs than did the experiments which established the L-grid correlation. Dzenis Affidavit at 6-7. The WRB-1 is known to apply reliably to OFA fuel arrayed in either 17 x 17 or 14 x 14 geometries. The geometry of the cores in Units 3 and 4 is 15 x 15. Hsii Affidavit at 5. The SRP has for some years expressed approval of both the DNBR of 1.3 for LOPAR fuel and of lower DNBRs for OFA fuel where circumstances permitted. SRP at 4.4-3.

The terminology of Contention (d), set out below, is drawn from the conventional terminology which deals with nucleate boiling:

The proposed decrease in the departure in the nucleate boiling ratio (DNBR) would significantly and adversely affect the margin of safety for the operation of the reactors. The restriction of the DNBR safety limit is intended to prevent overheating of the fuel and possible cladding perforation, which would result in the release of fission products from the fuel. If the minimum allowable DNBR is reduced from 1.3 to 1.7 [sic: 1.17] as proposed, this would authorize operation of the fuel much closer to the upper boundary of the nucleate boiling regime. Thus, the safety margin will be significantly reduced. Operation above the boundary of the nucleate boiling regime could result in excessive cladding temperatures because of the departure from the nucleate boiling (DNB) and the resultant sharp reduction in heat transfer coefficient. Thus, the proposed amendment will both significantly reduce the safety margin and significantly increase the probability of serious consequences from an accident.

The particular focus of the contention appears to be on the mere fact that the DNBR which the amendments apply to the new fuel in Units 3 and 4, the OFA fuel, is lower than the DNBR which has been applied to the older type of fuel, the LOPAR fuel.⁹ We would not be denying summary disposition on the motion if the Intervenor raised no issue other

⁹ The wording of the contention is imprecise enough to permit it to be construed to be saying that the amendments apply the DNBR of 1.17 to all the fuel in Units 3 and 4, even the LOPAR fuel. Such is not the case.

than the one of this mere difference between the two DNBRs, for, although under the amendments, the differences between AHFs and CHF's for the OFA fuel may be proportionately less than the same differences for LOPAR fuel, these differences are not the true measures of the margins of safety between AHFs and CHF's. The true measures are probability measures: If a lower DNBR, and, consequently, proportionately smaller differences between AHFs and CHF's, do not lessen the probability that a CHF will not occur in normal operation and certain abnormal occurrences, then the lower DNBR does not diminish the margins of safety between the AHFs and the corresponding CHF's.

If this last statement seems counterintuitive, it may be because it is not unusual for a decrease in some measurable magnitude to entail a decrease in safety. Usually, the closer one drives to the edge of a road, the more likely one is to go off the edge of the road. However, the behavior of a prudent driver depends on how clearly he can see the edge of the road. If the edge is shrouded in fog, the prudent driver will steer clear of where he thinks the edge might be, and the more in doubt he is about where the edge is, the more he is inclined to stay away from where he thinks it might be. If, however, the fog clears some, the driver, by moving closer to the edge of the now more visible road, does not increase his chances of going off the road.

Similarly with CHF's in the operation of a reactor: The more doubt there is about what the CHF's are, the greater will be the prudent minimum DNBR. But if increased precision in the models of the behavior of coolant flowing through bundles of heated tubes allows for increased accuracy in the predictions of CHF's, then the minimum DNBR can be lowered without decreasing the probability that DNB will be avoided.

It is this stability in the measure of probability that the Licensee's affiant has in mind when he says that the lower DNBR applied to the OFA in Units 3 and 4 "in no way implies a reduction in the safety margin of a nuclear reactor." Dzenis Affidavit, ¶ 24. Here, by "safety margin," the Licensee's affiant means the 95/95 standard, which, according to the Licensee, is the standard applied to both kinds of fuel at Units 3 and 4.

The Intervenor's affiant Dr. Edwards, while entertaining the possibility that "the same margin of safety that was previously thought to exist can now be achieved at a higher operating temperature" (Edwards Affidavit, ¶ 9(j)), nonetheless asserts that "it is undoubtedly true that running at a hotter temperature materially increases the probability of DNB, and therefore reduces the safety margin of the nuclear reactor." (*Id.*; see also ¶¶ 9(i) and 10.) Paraphrased so as to remove the seeming self-contradiction from his remarks, and to bring into better focus the differences between his remarks and the Licensee's affiant's claim, what

Dr. Edwards says is that although a given probability measure of a margin of safety — in this case the 95/95 standard — may now be achievable at higher temperatures, the probability measure of the margin at those temperatures nonetheless is smaller than it would be at lower temperatures.

Dr. Edwards is, of course, right. If, for a given fuel, a DNBR of 1.17 gives a 95% confidence that there is a 95% probability that DNB will occur, then the imposition of the DNBR of 1.30 would no doubt increase either the measure of confidence, or the measure of probability, or both. Dr. Edwards is, in effect, asking for the imposition of a standard more stringent than the 95/95 standard. Yet he has nowhere argued, nor have the Intervenor argued, that there is any defect in the 95/95 standard.

However incorrect the Intervenor may be in thinking that it is imprudent to permit a lower minimum DNBR for OFA fuel than for LOPAR fuel, facts reported in the Staff's response to the Licensee's motion show that the Intervenor's principal allegation, namely, that there has been a lowering of a DNBR to the point of trimming a safety margin, raises a genuine issue concerning a material fact in the proceeding. Intervenor Lorion's affidavit claims, in particular, that two matters have not been adequately accounted for in setting a DNBR of 1.17 for the OFA fuel in Units 3 and 4: First, as we reported earlier, the experimental base for the WBR-1 correlation established that a DNBR of 1.17 for OFA fuel arrayed either in a 17 x 17 or a 14 x 14 geometry meets the 95/95 standard; however, the arrays in Units 3 and 4 are 15 x 15. Lorion Affidavit at 8. Second, during the years of transition between fuel types, the difference between the hydraulic resistance of the LOPAR fuel and the hydraulic resistance of the OFA fuel, a difference which was taken into account in predicting peak cladding temperatures, the subject of Contention (b), must be taken into account, Intervenor Lorion says, in determining a minimum DNBR. *Id.*

The Licensee's motion wholly ignores both of these matters. The Staff's affiant raises them briefly, and one other, which we shall discuss shortly, but brushes them aside, though not before making it appear that, in fact, the applying of a DNBR of 1.17 to the OFA fuel in Units 3 and 4 may well not satisfy the 95/95 standard.

On the next to the last page of his affidavit, the Staff's affiant reveals that in its Safety Evaluation Report (SER) on amendments 93 and 99, published December 23, 1983, the Staff relied on a DNBR of 1.34 for the OFA fuel in the cores in Units 3 and 4, a figure which the Staff says is 12.7% higher than the 1.17 figure applicable to a full core of OFA in an array either of 17 x 17 or 14 x 14. The Staff's affiant says that the 12.7% allowed room for several uncertainties, only the smallest of which

he notes in his affidavit, namely, a 2% uncertainty about the applicability of the WRB-1 correlation to OFA fuel arrayed in a 15 x 15 geometry. Hsui Affidavit at 5. The two larger uncertainties reported in the SER are associated with the difference between the hydraulic resistances of the two kinds of fuel (SER on Amendments at 4), and with the bending of the fuel rods during operation (*id.*), a phenomenon caused by, among other things, lengthwise expansion of the heated rods while they are anchored at their ends. This bowing can constrict the flow channels between the rods and thus can affect how efficiently heat is transferred from the rods to the coolant.¹⁰ The SER lists the uncertainty associated with the difference in hydraulic resistance as 3%, and the uncertainty associated with rod bowing as 5.5%. *Id.* That is, we take it, the DNBR of 1.34 which the Staff applied in its SER could have been 2% lower but for the 15 x 15 array, 3% lower but for the mix in the core, and 5.5% lower but for rod bowing.

The implication of the SER's discussion of DNBRs is that since a DNBR of 1.34 allows 12.7% for these three uncertainties, a DNBR of 1.17 does not. The question naturally arises then whether, if a DNBR of 1.17 does not take these three uncertainties into account, it does not amount, in fact, to a reduction in the safety margin the Standard Review Plan would ordinarily impose, that is, whether, under the amendments' imposition of a DNBR of 1.17 there can no longer be a 95% confidence that there is a 95% probability that DNB will not occur during certain specified operating conditions. The last sentence of ¶ 8 of the Staff's affidavit seems to say that there is no longer that confidence: After reporting that the 12.7% difference between the SER's DNBR of 1.34 and the more generally applicable DNBR of 1.17 compensated for the uncertainties identified in the SER, the Staff's affiant says, "[t]herefore, the DNBR limit of 1.17 for WRB-1 as applied to the Turkey Point 15 x 15 OFA does not result in significant reduction in safety margin." However, he explains neither his "therefore" nor his judgment that the reduction is not significant.

The Licensee sheds no light on whether the application of a DNBR of 1.17 to the OFA fuel in Units 3 and 4 in fact means that the 95/95 standard is not being met. As we said, the Licensee's pleadings on the motion do not even mention either the 1.34 DNBR used by the Staff in its SER on the amendments, or any of the three uncertainties for which the 1.34 was compensation. During the prehearing conference on March 26, 1985, the Licensee did discuss the two uncertainties which Intervenor Lorion raised in her affidavit. The Licensee did argue that the application

¹⁰ Intervenor Lorion does not mention this last uncertainty.

of the 1.17 DNBR to the Turkey Point arrays of 15 x 15 was justified (Tr. 180-81), but the Licensee did not say whether, or how, the 2% uncertainty the Staff assigns to such application was accounted for in the DNBR of 1.17. During the prehearing conference, the Licensee did report the 3% uncertainty associated with the difference between the hydraulic resistances of the two kinds of fuel, but simply asserted, without explanation, that the 3% penalty "does not cause any of the fuel to go below its appropriate safety limit as defined previously," by which, we take it, the Licensee meant that even when the 3% penalty is taken into account, the application of the 1.17 DNBR to the OFA fuel in Units 3 and 4 still meets the 95/95 standard. Tr. 189. The Staff would appear not to agree.

Under this contention three genuine issues as to material facts remain for litigation:

1. Whether the DNBR of 1.17 which the amendments impose on the OFA fuel in Units 3 and 4 compensates for the three uncertainties outlined by the Staff in its December 23, 1983 SER on the amendments, at 4.
2. Whether, if the DNBR of 1.17 does not compensate for those uncertainties, the SRP's 95/95 standard, or a comparable one, is somehow satisfied.
3. Whether, if that standard is not being satisfied, the reduction in the margin of safety has been significant.

The Licensee has the burden of showing in hearing either that the application of a DNBR of 1.17 to the OFA fuel in Units 3 and 4 satisfies the 95/95 standard, or that if such application does not, the reduction in the margin of safety is not significant.

Accordingly, Licensee's motion for summary disposition of Intervenor's Contention (d) is denied.

ORDER

For all the foregoing reasons and upon consideration of the entire record in this matter, it is, this 16th day of August 1985,

ORDERED

1. That the Licensee's motion to strike the Intervenor's response and affidavits in opposition to the Licensee's motions for summary disposition, and the Intervenor's motion to strike the Licensee's motion to strike, are denied;

2. That the Licensee's motion for summary disposition of Intervenor's Contention (b) is granted, and the Intervenor's related motion to

suspend or revoke the license amendments for Units 3 and 4 is denied; and

3. That the Licensee's motion for summary disposition of Intervenor's Contention (d) is denied.

APPEALABILITY

A denial of a motion for summary disposition is interlocutory and therefore cannot be appealed. *Louisiana Power and Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-220, 8 AEC 93, 94 (1974). Since this Order dismissed some, but not all, of the Intervenor's contentions, the Intervenor is still parties to this proceeding; therefore, the dismissal of Contention (b) is interlocutory, and any appeal the Intervenor may wish to take from that dismissal must await the issuance of an initial decision. See *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), ALAB-736, 18 NRC 165, 166 (1983).

THE ATOMIC SAFETY AND LICENSING BOARD

Robert M. Lazo, Chairman
ADMINISTRATIVE JUDGE

Emmeth A. Luebke
ADMINISTRATIVE JUDGE

Richard F. Cole
ADMINISTRATIVE JUDGE

Dated August 16, 1985,
Bethesda, Maryland.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Ivan W. Smith, Chairman
Sheldon J. Wolfe
Gustave A. Linenberger, Jr.

In the Matter of

Docket No. 50-289-SP
(ASLBP No. 79-429-09-SP)
(Restart Remand on
Management)

METROPOLITAN EDISON COMPANY,
et al.
(Three Mile Island Nuclear
Station, Unit No. 1)

August 19, 1985

In this Partial Initial Decision, the Licensing Board resolves the remanded "Dieckamp mailgram issue" in favor of the Licensee.

APPEARANCES

On behalf of the Metropolitan Edison Company, Licensee: Ernest L. Blake, Jr., Esq., and David R. Lewis, Esq.

On behalf of the United States Nuclear Regulatory Commission: Jack R. Goldberg, Esq., and Lois R. Finkelstein, Esq.

On behalf of Three Mile Island Alert, Intervenor: Lynne Bernabei, Esq., and Joanne Doroshow, Esq.

On behalf of the Commonwealth of Pennsylvania: **Thomas Y. Au,**
Esq.

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PARTIAL INITIAL DECISION ON THE REMANDED ISSUE OF THE DIECKAMP MAILGRAM

I. INTRODUCTION

This Partial Initial Decision disposes of the so-called "Dieckamp mailgram issue," a matter remanded by the Appeal Board to the Licensing Board for further proceedings in ALAB-772, 19 NRC 1193 (1984). The remanding order pertained to the Licensing Board's respective partial initial decision dated August 27, 1981, LBP-81-32, 14 NRC 381, 555-56.

On March 28, 1979, the day of the accident at Three Mile Island Unit 2, at 1:50 p.m. (approximately 10 hours after the initiation of the accident), there occurred a detonation of hydrogen in the TMI-2 containment building. It was later determined that the hydrogen had been produced by an interaction of zirconium alloy fuel cladding with steam in the reactor core, a phenomenon resulting from core temperatures greater than 2000°F. The core had necessarily been severely damaged by that time.

The hydrogen combustion produced a containment pressure "spike" or excursion recorded to be from about 3 to 28 psig, followed by an immediate decrease in pressure to 4 psig. The spike was recorded on both channels of the containment building pressure recorder strip chart which showed a sharp "spike" at the time. The pressure spike started the containment building spray pumps. Each pump required for starting that two out of three pressure sensors detect pressures of about 30 psig. Simultaneously a sound was heard described by some as a "thud" or a "whoomp," which was later determined to be water hammer in the containment spray system. The containment isolated on an engineered safety feature. Some alarms actuated. A few minutes after the pressure spike, the spray pumps were secured and the operators directed their attention to other matters. The hydrogen detonation was not reported by the Licensee until March 30. This is a matter of significance, because an earlier appreciation that the core was severely damaged would have been important to emergency actions in the vicinity of Three Mile Island.

On May 7, 1979, Congressman Morris K. Udall, Chairman of the Subcommittee on Energy and the Environment of the House Committee on Interior and Insular Affairs, other Congressmen, and NRC Commissioner Victor Gilinsky toured Three Mile Island. Mr. James Floyd, then TMI-2 supervisor of operations, conducted the tour. Mr. Herman Dieckamp, then and now President and Chief Operating Officer of General

Public Utilities Corporation, participated in the tour. Mr. Floyd mentioned the pressure spike and initiation of containment building spray. He identified the containment building pressure recorder and discussed the conclusion that the pressure spike was not a spurious electrical signal because spray initiation required coincidence of at least two pressure indicators. Mr. Floyd also stated that the pressure spike was in full view of an NRC inspector.

The tour was reported in the *New York Times* on the next day, May 8, 1979. The article was entitled "Lag in Reporting Reactor Damage Laid to Experts" and stated in its lead sentence:

A technician from Three Mile Island nuclear plant told Congressmen today that control room personnel and Federal inspectors knew the plant's fuel core was seriously damaged two days before the damage was formally reported and the seriousness of the accident made public.

The pressure spike was cited as the basis for this statement.

Mr. Dieckamp later explained that he was disturbed by the article because he believed that there was an actual delayed recognition of the pressure spike significance and of the severity of core damage that had occurred during the accident. On May 9 he sent a mailgram to Congressman Udall with a copy to Commissioner Gilinsky and other NRC Commissioners. The mailgram stated in pertinent part:

There is no evidence that anyone interpreted the "pressure spike" and the spray initiation in terms of reactor core damage at the time of the spike nor that anyone withheld any information.

In March 1980 NRC Chairman John Ahearne directed the Office of Inspection and Enforcement to conduct an investigation into suspected information-flow deficiencies during the accident. Included was the reportability of the pressure spike. The result of that investigation was published in NUREG-0760 (January 1981). NUREG-0760 reported that Shift Supervisor Joseph Chwastyk had stated that he was aware on March 28 that the pressure spike was real, that it was caused by hydrogen, generated by a zirconium/water reaction in the hot core, and that he had reported that information on March 28 to the TMI Station Manager and Emergency Director, Gary Miller.

NUREG-0760 also reported that another shift supervisor, Brian Mehler, had stated that hydrogen was discussed on March 28. This was in the context that electrical equipment should not be operated in the containment in order to prevent ignition. Theodore Illjes, a control room operator, made a similar statement, also reported in NUREG-0760. These statements by Messrs. Chwastyk, Mehler, and Illjes, were

largely discounted in NUREG-0760. But, even if the statements were not accurate, they could impugn Mr. Dieckamp's mailgram statement that no such evidence existed.

Then, turning their attention to Mr. Dieckamp's mailgram, the Staff investigators concluded that it did not constitute a false material statement because it was not a statement required to be made under the Atomic Energy Act.

The Licensing Board was then conducting hearings on Licensee's management, including integrity aspects, and, on March 18, 1981, Mr. Norman C. Moseley, the lead investigator in the information-flow inquiry, appeared as a Staff witness. We could not accept the Staff's simple test for "false material statement" under the statute, because our inquiry was a broader one into the integrity of Licensee's management. No party pursued the matter, however, and after brief questioning of Mr. Moseley, we allowed the matter to rest on NUREG-0760 and on Mr. Moseley's stated conclusion that Mr. Dieckamp had believed the mailgram to be true when sent.

The issue was appealed and the Appeal Board remanded the matter to the Licensing Board for further proceedings. The Appeal Board explained that our reliance upon NUREG-0760 and Mr. Moseley's testimony was misplaced. We erred primarily because that report was too summary; because our questioning of Mr. Moseley on the point was insufficiently penetrating; because there was then no firm record evidence that Mr. Dieckamp was ever interviewed on the matter; and because we should have examined Mr. Dieckamp on our own. ALAB-772, 19 NRC at 1266-67.

The Appeal Board defined the issues on remand as follows: (1) whether anyone interpreted the pressure spike and containment spray, at the time, in terms of core damage, and (2) who or what was the source of the information that Mr. Dieckamp conveyed in the mailgram. The Appeal Board also defined the first issue as "was there evidence that anyone interpreted the pressure spike in terms of core damage at the time of the spike, and was such information withheld." The Appeal Board characterized the scope of this inquiry as "relatively limited." ALAB-772, 19 NRC at 1267 n.103, 1268.

The Licensing Board added a third facet: whether, when, and how any such interpretation was communicated to Mr. Dieckamp. The Board also accepted as subissues: (1) whether Mr. Dieckamp took steps to correct any misstatement upon learning the facts; (2) did Mr. Dieckamp expect the mailgram to be relied upon and to be important to the regulatory process; and (3) should Mr. Dieckamp have known the facts and

did he make any effort to discover them. Memorandum and Order Following Prehearing Conference (July 9, 1984) (unpublished), at 8. However, the Board ruled that corporate agency and imputed scienter were not issues in this proceeding. Rather, the key subissue is whether anyone *actually* interpreted the pressure spike and spray initiation in terms of core damage, not whether anyone *should* have made that determination. With respect to whether Mr. Dieckamp should have known the facts, the Board ruled that the appropriate standard was whether he acted with careless disregard for the accuracy of the mailgram. Memorandum and Order Ruling on First GPU-TMIA Discovery Dispute (August 13, 1984) (unpublished), at 3-4.

In addition to the Licensee and NRC Staff, Intervenor Three Mile Island Alert (TMIA) and the Commonwealth of Pennsylvania (Commonwealth) participated in the remanded proceeding. The Commonwealth, however, elected not to file post-hearing proposals. There was extensive prehearing discovery.

Twenty-four witnesses testified at the hearing.¹ The parties also stipulated into evidence 144 prior interviews, depositions, and reports; and portions of a number of the TMIA depositions were admitted in lieu of live testimony.²

II. SUMMARY AND COMMENTS

Mr. Dieckamp came to the hearing to avow that he believed that the mailgram was true. We believe him. It was not until March 30, 1979, 2 days after the accident, that he learned about core temperature readings exceeding 2000°F, the zirconium/water reaction, the combustion of hydrogen, and core damage beyond local failed fuel. In fact, the evidence establishes that Mr. Dieckamp did not even know about the pressure spike until March 30. The real question was whether, in the following weeks and before his mailgram, he learned that others may have possessed that information on March 28. The issue of whether Mr. Dieckamp may have acted with careless disregard for the facts in sending the mailgram evaporated early in the hearing, because, beginning on

¹ Appendix A (not published) is a list of witnesses and transcript citations to their testimony, as well as a list of documentary material bound into the transcripts.

² Appendix B (not published) is a list of exhibits offered or received in this proceeding. The 144 prior interviews, depositions, and reports which were stipulated into evidence were marked as 144 items in Part C of Joint Exhibit 1. However, for simplicity we have cited the items in Part C of Exhibit 1 as prime exhibit numbers; e.g., the Joint Exhibit marked as 1(c)(35) is cited as "Joint Exh. 35." Appendix C lists the principal participants in the activities related to the mailgram issue and briefly describes the role of each.

March 31, he worked at Three Mile Island and was deeply involved in the recovery efforts.

Central to Licensee's case was its explanation of how GPU management, and Mr. Dieckamp, became aware of the significance of the pressure spike and containment spray actuation. Several individuals in the control room were aware of the pressure spike tracing and even more heard the noise. Most thought that the spike was an electrical anomaly if they had any perception at all. Two, however, Messrs. Chwastyk and Mehler, appreciated the fact that the spike was real because of the simultaneous initiation of containment sprays. The spike did not seem to have any lasting effect upon plant status at the time, and there were other matters to attend to. The incident seemed to pass from the operators' thoughts. But later, on evening of March 29, Richard Bensel, TMI-2 lead electrical engineer, and Ivan Porter, TMI-2 lead instrumentation engineer, and perhaps others, began to collect photocopies of plant parameter strip charts to begin the accident analysis. Mr. Bensel noted the pressure spike tracing, learned that the containment spray had actuated, and he too then realized that the spike was real. In the meantime, Mr. William Lowe, a highly respected nuclear engineer, and Chairman of the engineering firm of Pickard, Lowe and Garrick, was working with the recovery planning group of the GPU Accident Events Analysis and Recovery Planning Team. Mr. Bensel brought his information to Mr. Lowe.

Mr. Lowe's extensive background in nuclear engineering and chemistry enabled him to recognize that the spike might have been the result of a hydrogen ignition, in part, from the shape of the tracing. Other factors, subatmospheric containment pressure, for example, reinforced his analysis. He suspected immediately that there had been a zirconium/water reaction. Subsequent calculations that night confirmed his analysis. Mr. Dieckamp learned about Mr. Lowe's discovery the following day, March 30.

The Board found Mr. Lowe's testimony to be especially convincing — in part because of his demeanor, but more importantly, because of the inherent logic of his account. He had not been at the island on the 28th but had been in consultation since the early hours of that day. He arrived there in the early afternoon of the 29th. He had extensive communications with other members of the analysis and recovery task force and plant personnel. He believes that he was the first to identify the pressure spike as a hydrogen burn. He believes, as we do, that it is inconceivable that that information could have been concealed earlier.

But Joseph Chwastyk, TMI-2 Shift Supervisor, actually saw the pressure chart tracings rise and fall. He knew that the sprays had actuated

and he shared with Brian Mehler an early understanding that the pressure spike was real — not an electrical anomaly. In October 1979 Mr. Chwastyk told the Special Inquiry Group that he knew on March 28 that there had been a hydrogen explosion. In September 1980 he told the special NRC team investigating information flow that, not only did he know on the 28th that there had been a hydrogen explosion, but that he knew on the 28th that there had been core damage and heat sufficient to produce a zirconium/water reaction. He said that he promptly reported this information to the Station Manager and Emergency Director, Gary Miller, and imparted it to others that day.

The Board listened to Mr. Chwastyk over 2 days. We have read every relevant statement reported on his memory of March 28, 1979. Mr. Chwastyk simply is not to be believed on this subject. His memory became increasingly accurate over time, but then faltered at the hearing. There was no corroboration of his statements that he told others about hydrogen and zirconium/water reaction. His actions were not consistent with his asserted awareness of severe core failure. He had sharply varying accounts of his understanding of hydrogen and his reporting of it. In the findings below we explain that these conclusions are not intended to disparage Mr. Chwastyk's candor. He, more than any other witness to the events of March 28, has been confused by after-acquired information. He makes no allegations. He is, himself, concerned about his memory. He feels that his statements have been overanalyzed and that his meanings have not been fully and accurately understood.

Brian Mehler, on duty as a shift supervisor with Mr. Chwastyk at the time of the spike, was interviewed in August and October 1979. He stated with emphatic assuredness that an order was given on the evening of March 28 not to start electrical equipment in order to avoid igniting hydrogen. Subsequently, however, investigators pointed out to Mr. Mehler that his memory was at odds with log entries and the accounts of other participants. Mr. Mehler consulted the logs, compared his memory with others, including Mr. Chwastyk; engaged in some introspection; and came to the conclusion that it is more likely that the order not to operate electrical equipment was given on the 29th. He later explained that the days of the accident seemed to run together and that it was hard to recall what he remembered, compared to what he was told and what he read.

Mr. Theodore Illjes, a control room operator, stated on May 23, 1979, that, in the evening of March 28, a hydrogen explosion had been discussed as a possible cause of the pressure spike. As with Mr. Chwastyk, we came to the conclusion that Mr. Illjes' memory has been influenced by information acquired after the 28th. The most significant example of

this was that Mr. Illjes recalled a concern about a "hard" noncondensable bubble in the reactor vessel head on March 28. It is beyond any dispute that the existence of the noncondensable hydrogen bubble in the reactor vessel head did not become a matter of concern until Messrs. Lowe, Thomas Crimmins, and James Moore calculated the volume of hydrogen in the reactor vessel very late on March 29 and in the early morning hours of March 30. Mr. Illjes also believed that the containment pressure record tracings were photocopied on March 28, but the better evidence is that it was on the 29th that this was done. Mr. Illjes' testimony at the hearing demonstrated that he had a very unreliable memory.

It is also significant that, of the three individuals who stated that, on March 28, they were aware of hydrogen, only Mr. Mehler had been interviewed before Mr. Dieckamp sent his mailgram on May 9, 1979. In an April 25, 1979 interview, Mr. Mehler alluded to the pressure spike but made no reference to his later recollection that hydrogen ignition was a concern on March 28. Whatever the validity of the statements by Messrs. Chwastyk, Mehler, and Illjes, there is no reason to believe that Mr. Dieckamp had any evidence on May 9 that any of them knew about hydrogen on March 28.

The Board has pored over the statements of seventeen others who were in the control room at one time or another on March 28th (including two NRC inspectors) who, because of their duties, would probably have been aware that the pressure spike was recognized as a hydrogen explosion if such were the case. About half of them did not even know on March 28 that a pressure spike had been identified on the strip chart. The other half, those aware of the tracing on the 28th, were about evenly divided among those who thought it was an electrical anomaly, and those who simply did not understand it.

As noted, the Board discounts entirely the statements of Messrs. Chwastyk, Mehler, and Illjes to the effect that a hydrogen detonation was identified on March 28. With that, the case against Mr. Dieckamp becomes inconsequential. When considered with the additional fact that virtually no one else in the control room realized the spike was real, let alone a zirconium/water-hydrogen combustion, the case against Mr. Dieckamp vanishes.

We are left, then, to ponder how it could have been that an event of such significance was not appreciated at the time. In the first place, the pressure spike appeared on the pressure recorder at a time when operating and analysis personnel had their hands full trying to understand the conditions they were dealing with so that they could proceed with confidence to recover from the accident. The pressure trace rose and fell back almost to normal very quickly, with seemingly minimal consequences to

indicate any substantive change to the puzzling situation being confronted. It seems to be a normal response for the persons concerned to have concentrated on the puzzle-solving task before them, particularly since there was little appreciation that the spike actually represented a true pressure transient.

In the second place, for the significance of such an event to have been appreciated would have required a somewhat complex conceptual analysis involving such questions as (a) what substance (gas or steam?) could be available to raise the pressure of so large a volume to the value seen from the trace; (b) what mechanism could account for the rapid return of the pressure to a near normal value; and (c) what mechanism could have provided the source of such a substance whose behavior would be consistent with observations at the time? The passage of time has seen answers to these questions evolve. But at the time, the persons involved could not cope with such questions. The operational personnel of TMI-2 were not schooled in the chemical and thermodynamic properties of zirconium in a high-temperature steam environment, or the exothermic and autocatalytic nature of reactions that might result therefrom. It was known that hydrogen could be one of the reaction products. The Final Safety Analysis Report for TMI-2 analyzed hydrogen production following a postulated loss-of-coolant accident in terms of months before the flammability range would be reached. Two very experienced operations persons, Messrs. Michael Ross and William Zewe, on the day of the occurrence did not see how such a large buildup of hydrogen in the containment building (approximately 2 million cubic foot volume) could occur so rapidly. Mr. Moseley, who led the team that performed the information-flow investigation, testified:

I concluded that on March 28, 1979, it was beyond the range of credible operator knowledge to infer that amounts of hydrogen sufficient to reach a flammable concentration in a two million cubic foot containment might exist at 10 hours after the initiation of the event.

In addition to resolving the mailgram issue on our own, it was also our duty to hear and decide the cases presented by the Commonwealth and the Intervenor TMIA. The Commonwealth had no position. TMIA's case against Mr. Dieckamp rests on two theories. First, there is a very large body of data consisting of interviews, testimony, investigation reports and other records. From this pool of information, TMIA would have us believe only the small and unreliable portion indicating an awareness on March 28 of hydrogen. TMIA would have us disregard all evidence to the contrary. TMIA's selection from Mr. Chwastyk's varying accounts of the relevant events is a refinement of this strategy.

TMIA's other theory of the case is that there has been a criminal perjury and subornation-of-perjury scheme afoot in this proceeding. By our count TMIA, either directly or by strong implication, accuses fifteen of the twenty-four witnesses who testified before us of lying and invites an inference of perjury by even more witnesses. TMIA accuses GPU lawyers of pressuring company witnesses called by TMIA to lie, and suggests that the NRC Staff investigations have been deliberately restrained. In our Decision below we have alluded to TMIA's charges as disruptive, unfounded, and professionally reckless.

But TMIA's perjury theory is not merely reckless — it is logically absurd. The theory would have to depend upon a massive conspiracy to conceal a discovery on March 28th of the hydrogen detonation and its implications. Such a conspiracy would, of necessity, have been formed instantly among about twenty people present at the time, with either the acquiescence or the ignorance of NRC inspectors. The conspiracy would need to be expanded quickly to as many as a hundred individuals, perhaps even more. It would have to include, or be skillfully hidden from, the many engineers, scientists and the managers from other utilities who came to Three Mile Island following the accident to aid in the accident recovery and analysis. The conspiracy would have to escape the penetrating investigations of the Senate, the House of Representatives, the Kemeny Commission, the Special Inquiry Group, the multiple NRC inquiries, and our own proceedings with its thorough discovery opportunities. Finally, this conspiracy would have to be incredibly stable over 6 years.

In this remanded proceeding, and during the entire TMI-1 restart proceeding, this Board has not seen any evidence of even the slightest reliability to suggest that Mr. Dieckamp lied in his mailgram or evidence that in any way impugns his integrity.

Findings of Fact

III. ON WHAT INFORMATION WAS THE MAILGRAM BASED

A. Licensee's Case on Dieckamp's Knowledge

1. Introduction

1. Mr. Dieckamp came to the hearing to explain what he meant by the mailgram and how he arrived at the conclusions stated in it. He was supported in his testimony by those who were most intimately involved

in the recognition and interpretation of the pressure spike. Mr. Dieckamp and those reporting to him, together with their records, were subject to very penetrating and thorough prehearing discovery authorized by the Board. The cross-examination of those individuals reflected that discovery.

2. By way of background, Mr. Dieckamp explained that in using the term "core damage" in the mailgram, he was referring to the kind of significant damage that would be consistent with a major fraction of the zirconium having reacted with water or steam. Tr. 28,345 (Dieckamp). His frame of reference was the *New York Times* article, which he believed suggested that knowledge of the meaning of the pressure spike in terms of core damage could have influenced the decision to evacuate the populace from around Three Mile Island. For this reason, Mr. Dieckamp was referring to the degree of core damage sufficient to have cast doubt on the ability to cool the core with confidence. Tr. 28,948 (Dieckamp).

3. Mr. Dieckamp believed that, at the time he sent the mailgram, the pressure spike and its meaning were not understood on the day of the accident, and consistent with that belief, that no one made a conscious decision to withhold information about the spike. Dieckamp, ff. Tr. 28,316, at 18. The mailgram reflected Mr. Dieckamp's own understanding of the positive discovery and interpretation of the pressure spike — of the first recognition of its meaning on the night of March 29. *Id.* at 5, 9. Mr. Dieckamp first became aware of core damage *beyond local failed fuel* when he was informed of the pressure spike, the postulated mechanism of a hydrogen "explosion," and the reaction of zirconium and water as the source of the hydrogen. This information came to Mr. Dieckamp sometime on Friday, March 30, 1979.

4. His chronology of the events leading to this awareness began with a coincidence in that, on Wednesday, March 28, 1979, the day of the accident, Mr. Dieckamp had been in Harrisburg, Pennsylvania, attending a Pennsylvania Public Utility Commission meeting unrelated to TMI. Mr. Dieckamp had spoken with Walter Creitz (then Met Ed's President, who was in Reading, Pennsylvania) and with Robert Arnold (GPU Service Corp.'s Vice President of Generation, who was in Parsippany, New Jersey) on the morning of March 28. In the early afternoon of March 28, he had a very brief conversation on the steps of the Pennsylvania State Capitol with John Herbein (then Met Ed Vice President of Generation), Gary Miller (then TMI Station Manager), and George Kunder (then Supervisor of Technical Support-TMI-2), who were on their way to brief the Lieutenant Governor. Later on Wednesday evening after returning to his home in New Jersey where GPU's corporate offices are located, Mr. Dieckamp again spoke to Robert

Arnold. On Thursday morning, March 29, he met briefly with Mr. Arnold in order to review and sign a memorandum establishing a "Task Force" to investigate and analyze what was then thought to have been a severe plant transient. On Thursday afternoon, he attended a briefing for a group of Congressmen at the TMI visitor's center; and at this time, he spoke with R. Vollmer of the NRC and with some members of the Task Force. On Thursday evening, Mr. Dieckamp again spoke to Mr. Arnold. Mr. Dieckamp testified that at no time on March 28 or March 29 did anyone mention to him core temperatures in excess of 2000°F, the pressure spike, zirconium/water reaction, hydrogen, or core damage beyond failed fuel. *Id.* at 5-9. No witness suggested otherwise. TMIA, however, argues that Mr. Dieckamp had all of this information earlier in the accident.

2. The Task Force Investigation

5. On Thursday, March 29, 1979, the Task Force — designated the "Events Analysis and Recovery Planning Team" — met at the TMI site. The team members met at about 3:30 p.m. in the TMI supervisors' conference room and were assigned to either an Events Analysis group or a Recovery Planning group. Mr. William Lowe, founder and Board Chairman of the consulting firm of Pickard, Lowe and Garrick, was one of the team members and was assigned to the Recovery Planning Group. Lowe, *ff.* Tr. 28,151, at 3-4. As will be seen below, it was Mr. Lowe who first interpreted the pressure spike in terms of zirconium/water reaction and hydrogen combustion — a point very much in dispute in this proceeding. Other team members present were Messrs. Richard Wilson (the Chairman), Edward Wallace, Donald Reppert, Gary Broughton, George Kunder, James Moore, Lee Rogers, Ron Williams, Thomas Crimmins, and Robert Long. With the exception of Mr. Rogers, who was B&W's representative, all these individuals were engineers or managers from GPU system companies. TMIA Exh. 18, at 3.

6. The information available to those attending the Thursday afternoon Task Force meeting is an important issue in this proceeding. TMIA generally argues that the full significance of the accident, particularly the pressure spike and hydrogen combustion was understood and discussed. The reactor building pressure recorder strip chart was available to the Task Force and general knowledge of plant status and accident progression was excellent according to TMIA. *See* § III.B, *infra*.

7. Mr. Lowe had a recollection, imprecise as to time, that at some time on March 29th the containment pressure spike was mentioned

his presence and said to be a spurious indication — a voltage anomaly in instrumentation. Mr. Lowe remembers being skeptical of the explanation. Mr. Lowe, however, did not see the strip chart during the afternoon meeting and does not recall anyone analyzing or exhibiting recognition of the significance of the containment pressure spike. Lowe, ff. Tr. 28,151, at 10; Tr. 28,177-78 (Lowe).

8. However, Mr. Thomas Crimmins (a GPU system engineer who attended the meeting) has stated that he remembers seeing the pressure trace during the meeting, but he too states it was assessed to have been a spurious instrument problem. Mr. Crimmins remembers no mention of hydrogen. TMIA Exh. 32F.

9. Mr. Kunder recalls a side discussion during or after the Thursday afternoon meeting in which he was shown the strip chart or a representation of the strip chart. He thinks Gary Broughton showed the chart to him. Tr. 30,001 (Kunder). He believes that hydrogen, along with instrument malfunction, were offered as possible explanations — possibilities that needed to be examined. Mr. Kunder, however, remembers no discussion of the pressure spike during the main meeting. Tr. 30,005 (Kunder).³ Nor does he remember any discussion or concern about a zirconium/water reaction. Tr. 30,016-17, 30,074 (Kunder). Mr. Kunder does believe he mentioned long-term hydrogen generation at the meeting, but merely as a topic for subsequent recovery planning and without discussion. Tr. 30,007-08 (Kunder).

10. Mr. Gary Broughton, GPU Service Corp. manager, remembers no discussion of the pressure spike or a hydrogen explosion at the meeting and no observation of the strip chart. Tr. 31,159 (Broughton). His recollection was corroborated by Mr. Richard Wilson. Tr. 31,530-31 (Wilson). Mr. Broughton does not remember that conversation concerning the pressure spike recalled by Mr. Kunder on March 29th. Mr. Broughton remembers in detail that he first learned that there had been a hydrogen explosion on Friday morning, March 30. Tr. 31,166, 31,198-201 (Broughton). Moreover, Mr. Broughton stated that when informed on Friday of the pressure spike, he at first did not understand that the pressure spike had not just occurred. Tr. 31,199.

11. In sum, it is unclear whether there was discussion of the spike or of hydrogen during the afternoon Task Force meeting on March 29. Hydrogen may have been mentioned and a record of the pressure spike may have been available.

³ Licensee points out that Mr. Kunder exhibited uncertainty in his recollection as to what was said about the pressure spike, by whom, and when, citing his May 23, 1979 IE interview. Joint Exh. 37, at 50-51; see also Joint Exh. 80, at 74-75.

12. It is probable that Mr. Kunder's memory associating the pressure spike record with hydrogen is imprecise on that point. It is more likely that hydrogen was discussed as one of the many aspects of the transient which should be explored. The subissue has grown out of proportion to its importance, because, even if the pressure spike had been recognized as real, and, even if it had been attributed to hydrogen, those facts would not undercut the accuracy of the mailgram or the spirit of the mailgram. The only relevance is one argued by TMIA, i.e., that the evidence that it was Mr. Lowe who first identified the spike and hydrogen later that day is incredible — a matter we address below in § III.B.

13. Later that evening (March 29) the Recovery Planning group reassembled and Mr. Lowe told Mr. Herbein that the basic problem was plant stabilization, not recovery, and that several senior people should be immediately assigned to the control room to help with stabilization and damage control. Messrs. Lowe and Crimmins volunteered. They sought information about plant status and were told that the primary system was still "mushy"; that is, it was hard to control pressurizer level. The operators thought there might still be a steam bubble outside the pressurizer, but none of the many temperature readings were high enough for that. Lowe, ff. Tr. 28,151, at 5-6.

14. In the meantime in the evening of the 29th, Met Ed engineers Richard Bensei, Ivan Porter, and others had begun to pull together and photocopy strip charts of various plant parameters during the accident in order to begin the event analysis. Mr. Bensei recalled that he began to review these charts to familiarize himself with them. Upon reviewing the reactor building pressure chart, Mr. Bensei found the 28-psig pressure spike. Joint Exh. 107, at 54 (SIG Report).

15. Mr. Bensei showed the spike to a number of other individuals who were in the control room area and who were concerned with operations. Mr. Bensei learned that the spray system had come on at the same time. Looking at the alarm printer, he also discovered that all six pressure switches had activated. This led Mr. Bensei to conclude that there had actually been an increase in reactor building pressure. *Id.* Mr. Bensei then showed the pressure spike to Mr. Lowe at about 11 p.m. on the 29th.

Mr. Lowe's Discovery of the Significance of the Pressure Spike

16. Mr. Lowe's background in chemistry and nuclear power plant accident analyses led him to the intuitive judgment from the shape of the spike that it had been caused by the ignition of hydrogen in the containment building and that the hydrogen had been generated by the in-

teraction of zirconium with steam in the reactor vessel. He postulated that the presence of hydrogen in the reactor vessel could explain the inability to stabilize the plant, the "mushiness," and could offer a potential for hydrogen expansion in the core that might prevent maintaining water coverage of the core. Mr. Lowe concluded that it was urgent to determine how much hydrogen was present and to eliminate it. Lowe, ff.Tr. 28,151, at 4-10.

17. At about 11:30 p.m. (on March 29, 1985) Mr. James Moore, an experienced GPUSC engineer arrived. Messrs. Moore, Crimmins and Lowe set about calculating the volume of hydrogen in the primary system above the core and ultimately determined (at about 3:30 a.m. on March 30) that the hydrogen volume was approximately 1100 cubic feet at 875 psi absolute (psia). B&W supplied them with the information that the free volume within the reactor vessel above the outlet nozzles is 1129 cubic feet. This comparison, plus the fact that the one primary pump that was running was functioning normally, led to the conclusion that the core was covered, but generated the concern that further depressurization of the reactor vessel could uncover the core and prevent core cooling. *Id.* at 10-12.

18. Shortly before 4:00 a.m. (on March 30), Mr. Lowe attempted to calculate the amount of zirconium that would have had to react with steam in order to account for the burned hydrogen in the containment plus the then-existing amount of hydrogen in the reactor vessel above the core. This led him to conclude that a large part or perhaps all of the zirconium had reacted and hence the core was seriously damaged. After discussions with Messrs. Crimmins and Moore, Mr. Lowe then recommended an approach toward removal of hydrogen from the reactor vessel while maintaining sufficient pressurization so as not to impede core cooling. Removal of the hydrogen from the reactor vessel was subsequently accomplished and confirmed, as was Mr. Lowe's interpretation of its significance. *Id.* at 13-14.

Mr. Dieckamp's Awareness of Core Damage

19. On Friday, March 30, and continuing for the next several days, Mr. Dieckamp gained an explicit understanding of this first recognition of the meaning of the pressure spike, the confirmation of hydrogen, and a rough quantification of the degree of core damage suggested by analysis of the zirconium/water reaction. Mr. Dieckamp recalls that his awareness of core damage increased abruptly on Friday, March 30, when he was informed of the pressure spike. In telephone conversations with personnel at the site, most likely Robert Arnold, Mr. Dieckamp was told of the

pressure spike recording being brought to the attention of the GPU Task Force during the night of March 29. Dieckamp, ff. Tr. 28,316, at 9; Tr. 28,348 (Dieckamp). Mr. Dieckamp also talked to Mr. Lowe by telephone several times near midnight on Friday, March 30. Lowe, ff. Tr. 28,151, at 15; Joint Exh. 86, at 22-23.⁴

20. Mr. Dieckamp learned that the Task Force had postulated a zirconium/water reaction as the source of the hydrogen and that the presence of hydrogen was recognized as being consistent with the abnormal pressure-volume behavior in the primary system. The postulate caused the plant staff to take steps to take a containment building gas sample and to take steps to permit operation of the hydrogen recombiner. Dieckamp, ff. Tr. 28,316, at 5, 9-10.

21. Mr. Dieckamp moved to the site on the afternoon of Saturday, March 31. He then became aware of the confirmation of hydrogen through analysis of the containment building gas sample, and thus the first quantitative indicator of the degree of core damage. *Id.* at 10.

22. During the first few weeks of April, Mr. Dieckamp remained at the site. He availed himself of early GPU interviews of operators, sat in on preliminary reviews of the sequence of events, participated in status reviews with the onsite NRC Staff, coordinated the activities of the Industry Advisory Group, and generally participated in managing the response to the accident. *Id.* at 10-11; Van Witbeck, ff. Tr. 28,261, at 2-3; Zebroski, ff. Tr. 28,441, at 11-12.

23. During the third week in April, Mr. Dieckamp assembled testimony for presentation to the Nuclear Regulation Subcommittee of the Senate Committee on Environment and Public Works (Hart Committee). Dieckamp, ff. Tr. 28,316, at 11.

24. Mr. Dieckamp did not conduct or cause to be conducted any additional inquiry into the facts beyond his own knowledge before sending the mailgram, nor does he remember consulting with anyone. He had neither heard nor seen any indication that on March 28 the pressure spike had been properly diagnosed as the product of a zirconium/water reaction or that the pressure spike caused the plant staff to change or adopt a strategy for bringing the plant to cold shutdown that recognized the presence of hydrogen or noncondensable gas. His examination of operator interviews and his involvement in development of the sequence of events revealed nothing to indicate that anyone had on the 28th

⁴ Mr. Dieckamp was also briefed on Friday by Robert Keaten, who had that morning obtained from Gary Broughton a sequence of events and update on the current status of the reactor. The update contained information on the explosion in containment and the bubble in the reactor. Joint Exh. 45, at 7; Tr. 31,247-49 (Keaten); TMIA Exh. 10, at 10-12. Mr. Dieckamp no longer remembers this briefing. Tr. 28,646 (Dieckamp).

identified the meaning of the spike and taken actions in response. *Id.* at 12.

25. Mr. Dieckamp believes that had operators and plant management correctly interpreted the pressure spike, they would have immediately turned on the high-pressure injection pumps and left them on. However, this action was not taken until around 5:30 p.m. — several hours after the pressure spike — at the direction of management that was unaware of the pressure spike and for reasons unrelated to the pressure spike. Tr. 28,901 (Dieckamp); Tr. 28,542-44 (Zebroski). *See also* Tr. 30,324-26 (Herbein) (referring to Joint Exh. 82, at 38-40); Joint Exh. 63, at 7 (NSAC-1 (July 1979)). In addition, they should not have left the block valve open, as it was, for more than an hour after the pressure spike. Tr. 28,842 (Dieckamp). Finally, Mr. Dieckamp believes that had the pressure spike been understood, Gary Miller and Jack Herbein would not have left the plant to brief the Lieutenant Governor. Tr. 28,906 (Dieckamp). This belief was confirmed by Mr. Miller in this proceeding. Tr. 30,239-42 (Miller).

B. TMIA's Case on Dieckamp's Knowledge

1. Introduction

26. TMIA attacks Licensee's position on the basis for the mailgram on four grounds. *See generally* TMIA Proposed Finding 241. (1) TMIA first argues that Dieckamp's belief that William Lowe was the first to interpret the pressure spike the night of March 29th/30th was not reasonable. (2) Second, TMIA argues that Dieckamp knew better because Herbein and Miller briefed him on plant status on March 28th, including the fact that a hydrogen burn had occurred. (3) Third, TMIA contends that Robert Keaten, on the basis of information obtained from Gary Broughton at the site the morning of March 29th, briefed Dieckamp on plant status and informed Dieckamp at that time of the hydrogen burn. (4) Finally, TMIA argues that Dieckamp's understanding of the degree of core damage on the 28th or early on the 29th implied that he was aware of the hydrogen burn at that time.

2. Mr. Lowe's Discovery

27. TMIA asserts that Mr. Lowe's testimony contains many contradictions. Its first example of such derives from a comparison of Mr. Lowe's testimony, regarding his being the first to understand the significance of the pressure spike, with the information contained in a memo

of December 4, 1979, written by Mr. Lewis Battist of the NRC/TMI Special Inquiry Group, Group #3. This memo states that during a telephone conversation (date not documented) with Mr. Lowe, the latter stated that he did not know that he was the first to have understood the spike's significance. TMIA Proposed Finding 287; Joint Exh. 104. We find no contradiction between Mr. Lowe's telling Mr. Battist that he did not know that he was the first such person and his testimony that he has no evidence to indicate otherwise. As Licensee points out:

Lowe was not present at TMI on March 28th and does not claim to *know* what people believed on that day. He did testify, however, that he "believed" he was the first to recognize its significance. Tr. 28,154-55 (Lowe). *See also* Tr. 28,216-17 (Lowe). This testimony presents no contradiction. As he testified, "*I find it inconceivable that if anyone had known hydrogen was present in containment and had ignited, they would have concealed that knowledge from peers or managers and that the on-site technical support team would not have been told of it.*" Lowe, ff. Tr. 28,151, at 14. [Emphasis added.]

Licensee Reply Finding 14.

28. On March 28, 1979, Mr. Lowe documented by memo a telephone conversation between himself and Mr. Jack Thorpe, at TMI, that took place at about 4:20 p.m. that day. The memo stated that Mr. Thorpe told Mr. Lowe: "Plant thinks core is recovered, but proof not yet established." TMIA Exh. 1. In his testimony, Mr. Lowe stated that: "He [Thorpe] reported the plant thinks core cooling is recovered." Lowe, ff. Tr. 28,151, at 3. TMIA interprets this as a misleading contradiction indicating in reality that Mr. Lowe knew on March 28 that the core had earlier been uncovered and subsequently covered again. Thus, reasons TMIA, Mr. Lowe knew of the seriousness of the accident on that date. TMIA Proposed Findings 288, 289.

29. Upon being questioned about this, Mr. Lowe testified that the term "recovered" is commonly used to mean that core cooling has been returned to some understandable state; and that it was much later when he made the shocking discovery that the core may have been uncovered. Tr. 28,161, 28,163 (Lowe). We find no basis in this situation to impugn Mr. Lowe's credibility. TMIA is making too much of a play on the word "recovered." Granting for sake of argument that both Messrs. Thorpe and Lowe had been thinking in terms of a core previously uncovered by coolant, there is no evidence to negate the conclusion that it was not until near midnight on March 27 and during the early morning hours on March 30 that Mr. Lowe's analysis of the pressure spike trace led him to conclude that the core had been seriously damaged.

30. TMIA also opines that Mr. Lowe's testimony is incredible because it appears that there were general discussions about the pressure

spike and hydrogen buildup during the afternoon meeting of the Task Force on March 29 well before Mr. Lowe's analysis of their significance. According to TMIA, Mr. Richard Wilson (GPU Service Corporation)

opened the meeting by stating that the company had assumed there had been core damage in the range of \$20 to \$30 million, and that a one-year outage was anticipated. Although different individuals attending the meeting have differing recollections about the meeting, what is striking is that the pressure spike, hydrogen burn, or production of hydrogen to flammable limits was discussed in some manner.

TMIA Proposed Findings 290, 291.

31. However, Mr. Wilson's one page of prefiled testimony and his answers to many questions subsequent thereto indicate that he based his core damage concept solely upon his awareness of radiation and that that concept was of several or perhaps many failed fuel pins in the core. It was in that context that the dollar and downtime estimates were made and discussed with the Task Force. Wilson, ff. Tr. 31,504; Tr. 31,505-44, *passim* (Wilson); *see also* Licensee Reply Findings at 16, 17. We find nothing to support TMIA's statement that the significance of the pressure spike, hydrogen burn, or production of hydrogen to flammable limits were recognized or discussed during the Thursday Task Force meeting.

32. TMIA refers to statements by Mr. J.D. Abramovici (GPU Service Corporation) that there was concern expressed about hydrogen building up to a 4% concentration and a discussion of hooking up a hydrogen recombiner, both occurring during the afternoon Task Force meeting on March 29. TMIA reasons that such a magnitude of hydrogen buildup in so short a time since accident initiation could only have derived from a zirconium/water reaction and, hence, at the subject meeting, there had to have been a recognition that a zirconium/water reaction had occurred. TMIA Proposed Findings 292-293.

33. However, Mr. Abramovici stated that George Kunder raised the concern about hydrogen but that Abramovici did not recall a discussion of how the hydrogen originated. Mr. Abramovici thought that Mr. Kunder had the results of a containment atmosphere sample. TMIA Exh. 32H, at 43-44. But such a sample was not taken until March 31, and showed 1.7% hydrogen. Lowe, ff. Tr. 28,151, at 13; *see also* Dieckamp, ff. Tr. 28,316, at 10. Mr. Kunder testified that he did not have any knowledge of hydrogen concentration until the weekend following accident initiation; and that his concept of hydrogen formation was in terms of a long-term effect rather than a short-term zirconium/water reaction. Tr. 30,011, 30,016 (Kunder). Attempts to contact Atomic International personnel to assist in setting up recombiners did not occur until Friday,

March 30. Tr. 31,010-11, 30,018-19 (Henrie). Thus, any discussion on March 29 about setting up a hydrogen recombiner was not in reference to a zirconium/water reaction source of hydrogen.

34. TMIA references two written comments by Mr. Crimmins (from Jersey Central Power and Light) for the proposition that the containment building pressure recorder spike was viewed and discussed at the Task Force meeting on the afternoon of March 29, and that Lowe should have immediately recognized its significance. TMIA Proposed Findings 294-296. Our own review of Crimmins' comments reveals his saying that: "The assessment at that time was that it must have been a spurious instrumentation problem." Mr. Crimmins did not recall any mention of hydrogen until late evening of the 29th or early morning of the 30th. TMIA Exh. 32F.

35. Finally, making references to notes, depositions and testimony, TMIA states that information derived from Messrs. Abramovici, Broughton, Kunder, and J.E. Henrie (Rockwell Hanford) supports TMIA's thesis that a hydrogen burn was discussed at the afternoon Task Force meeting on March 29, 1979, that spark-generating equipment was ordered not to be started because of the hydrogen concern, and that efforts to set up and operate hydrogen recombiners were initiated because of an awareness of a serious hydrogen problem. TMIA Proposed Findings 297-302. The Board has carefully reviewed the citations in TMIA's proposed findings and concludes that they do not support a finding that a consideration of the possible presence of hydrogen by any of the named individuals was in the context of a large amount of hydrogen deriving from the interaction of significant amounts of zirconium fuel cladding with water. This is consistent with Mr. Henrie's testimony that three successive inquiries (on March 28, 29 and 30, 1979) by Atomic International to GPU regarding the need to set up the recombiners met with negative responses. Tr. 31,011 (Henrie). Thus, we cannot accept TMIA's assertion that Mr. Lowe's testimony is not credible on that account.

36. Mr. Lowe's closing comments regarding this matter deserve special attention:

To recapitulate, no recognition of or even speculation about the significance of the pressure spike was expressed or implied in all of the extensive and intensive communications I heard or was party to from early morning of 28 March until the spike's significance was recognized at about 2300 on 29 March as I have described. These communications were with both senior and junior engineers, operators and managers, probably more than 50 in all. Nor did I hear about any such prior recognition from the hundreds of people I dealt with subsequently while on duty at TMI for nearly a month. Furthermore, the people I know and dealt with would not have

deliberately concealed such knowledge. And I state that judgment with emphasis and without qualification.

Lowe, ff. Tr. 28,151, at 15. When asked during the hearing whether he presently knows that he was the first person to recognize the significance of the pressure spike, Mr. Lowe testified that "all the evidence I've got so indicates." Tr. 28,217 (Lowe).

3. *Mr. Dieckamp's Information from Miller and Herbein*

37. As we noted at the outset, on Wednesday, March 28, Mr. Dieckamp was in Harrisburg for a meeting with the Pennsylvania Public Utility Commission unrelated to TMI-2. At about 2:30 p.m. on the steps of the Pennsylvania State Capitol, Mr. Dieckamp encountered Messrs. Herbein, Miller, and Kunder, who were on their way to a briefing of the Lieutenant Governor. Mr. Dieckamp had been excluded from that briefing session. Their conversation was very brief — Mr. Dieckamp expressed his concern about senior personnel being absent from the plant. Mr. Dieckamp testified that he could not recall any detailed discussion of plant parameters or conditions but that he gained the impression that the plant was stable. Dieckamp, ff. Tr. 28,316, at 5, 7. Mr. Herbein only recalls in pertinent part that Mr. Dieckamp asked who was "minding the store" at TMI-2. Tr. 30,378 (Herbein). Like Mr. Herbein, Mr. Miller could only recall Mr. Dieckamp's question about "who is minding the store." Tr. 30,214 (Miller). Mr. Kunder recalls a sense of urgency on the part of Mr. Dieckamp that they should promptly proceed to brief the Lieutenant Governor. Tr. 30,071 (Kunder).

38. Having gained the impression from these three men that the plant was stable, Mr. Dieckamp felt no need to contact either these men or other personnel at the site on March 28th after the briefing of the Lieutenant Governor. Tr. 28,403-05 (Dieckamp).

39. TMIA asserts that it is not credible that none of the four participants during the course of the encounter on the steps of the State Capitol could remember anything other than an off hand remark by Mr. Dieckamp. It argues that it is reasonable to conclude that Messrs. Herbein and Miller briefed Mr. Dieckamp on the status of the reactor at some time during the afternoon of March 28, and that this briefing necessarily would include informing him of incore thermocouple temperature readings greater than 2200°F, the pressure spike, and the hydrogen burn. TMIA Proposed Findings 195-202.

40. In § IV below, we discuss at considerable length the evidentiary record that establishes that neither Mr. Miller, Mr. Herbein, nor Mr. Kunder was aware of the pressure spike on March 28. We also find there

that, while Mr. Miller and Mr. Herbein were informed about preliminary incore thermocouple readings exceeding 2200°F on March 28, they did not regard those readings as reliable because of their improbable scatter. Mr. Kunder testified that he did not even know about incore temperatures in that range until weeks after the accident. Therefore it would have been impossible for any of those individuals to impart information about the pressure spike and its significance to Mr. Dieckamp during the encounter on the State Capitol steps.⁵

4. Mr. Dieckamp's Information from Keaten

41. On the morning of March 28, Mr. Robert Keaten, then Manager of Systems Engineering, GPU Service Corporation, located in Parsippany, sent Mr. Gary Broughton, then Control and Safety Analysis Manager, as well as a group of other engineers to investigate what had occurred at TMI-2.⁶ Tr. 31,238-39 (Keaten). On Friday morning, March 30th, Mr. Keaten telephoned Mr. Richard Wilson, then Director of Technical Functions, GPUSC, who had been at the plant site for over 12 hours. This was the first time that Mr. Keaten heard about a hydrogen bubble in the reactor. Later that morning, pursuant to a prior arrangement that Mr. Keaten in turn would brief Mr. Dieckamp, Mr. Broughton telephonically briefed Mr. Keaten. Tr. 31,131-32, 31,149 (Broughton); Tr. 31,246, 31,248-49, 31,255 (Keaten); Joint Exh. 45, at 7. Prior to placing this telephone call, on the morning of March 30th, Mr. Broughton was told for the first time by one of GPUSC's Task Force interviewers, Mr. Robert Long, that there had been a hydrogen explosion or burn on March 28th. Tr. 31,147, 31,170-71 (Broughton).

42. The notes made by Mr. Keaten, to record the information obtained from Mr. Broughton on the morning of March 30th, were set forth in five pages of a notebook. TMIA Exh. 10, unnumbered pp. 11-15; Tr. 31,263 (Keaten). These notes reflect *inter alia* that Mr. Broughton spoke about the sequence of events which had taken place on March 28th. Thereafter, under a separate heading, "Present Status," the following appears in the notebook:

⁵ It is by design, not oversight, that we have not followed TMIA's theory about the so-called "time gap." In essence TMIA argues that Messrs. Miller, Herbein and Kunder cannot account for their time between the briefing at the State House and their return to Three Mile Island and that Mr. Dieckamp cannot recall details of his trip back to New Jersey. TMIA Proposed Findings 187-188, 200-202. It is not as clear as TMIA would have us find, that there was a time gap in the return trip to the Island. But that is not the important point. We can find no basis to infer, from the void of information about the return trips, that any such time was used to inform Mr. Dieckamp about conditions back at the plant. Having found that Messrs. Herbein, Miller and Kunder did not have the information in the first place, it is pointless to unscramble TMIA's involved analysis.

⁶ See § IV.I, *infra*, re: GPUSC Engineers' Knowledge.

Bubble in reactor

Non-condensibles in Pressurizer

-lots-

Explosion in containment

1000 ft.³ at 1000 psi 280 degrees F260-280

Could be 100,000 ft.³

TMIA Exh. 10, at 13.

43. On the basis of his earlier conversation with Mr. Wilson and the subsequent one with Mr. Broughton, Mr. Keaten for the first time became fully aware on March 30th that the transient had been very severe in terms of damage to the reactor, that there was still a hydrogen bubble, that the plant was not in a stable configuration and that a lot of work remained to be done. Joint Exh. 45, at 7, 8; Tr. 31,292 (Keaten).

44. Shortly after the briefing by Mr. Broughton, at about 10:45 a.m., Mr. Keaten contacted and personally briefed Mr. Dieckamp at Parsippany. Tr. 31,248, 31,624 (Keaten). Mr. Dieckamp has no recollection of the content of the briefing but his notes indicate that he talked to Mr. Keaten on March 30th. Tr. 28,645-46 (Dieckamp).

45. TMIA contends that the Broughton-Keaten telephone conversation took place on the morning of March 29th because of the following:

- (a) The reporting procedures had been changed in that, as of the time Mr. Wilson arrived at the site during the afternoon of March 29th, Mr. Broughton was to report directly to Mr. Wilson, and thus Mr. Broughton's phone call to Mr. Keaten must have taken place on the morning of March 29th rather than on the morning of March 30th.

TMIA Proposed Findings 207-210. However, we are convinced that the Broughton-to-Keaten phone call was held on the morning of March 30th because, as found above, there was in place a prior arrangement that Broughton would contact Keaten and because we have found that both men were credible witnesses. Moreover, we are persuaded by the fact that as early as June 1, 1979, during the course of an interview with NRC personnel, Mr. Keaten stated that the phone conversation had been on Friday morning, the 30th (Joint Exh. 45, at 7).

- (b) The first of the pages of Mr. Keaten's notebook recording the conversation with Mr. Broughton bore the date of "3/29/79" but, sometime prior to October 19, 1979, when a copy of his notes was turned over to NRC investigators, Mr. Keaten inserted in red ink both a question mark after the date of "3/29/79" and a date of "3/30" below the date of "3/29/79." TMIA

urges that the date of "3/29/79" was correct because it was written initially, and because the first two entries related to Mr. Dieckamp's activities on March 29th and thus would not have been reported by Broughton or recorded by Keaten on March 30th.

TMIA Proposed Findings 214-215, 222-223. Again we found Mr. Keaten to be a credible witness when he testified that he inserted the question mark and the date of 3/30 because he deemed the date of 3/29/79 to have been an error (TMIA Exh. 10, at 11; Tr. 31,260-61, 31,271) and we see nothing unusual about Mr. Broughton fulfilling his duties by making a complete report upon Mr. Dieckamp's previous day's activities. (In passing, absent more, we cannot but conclude that Mr. Broughton erred in reporting that a Congressional briefing had taken place at 1:00 p.m. on March 29th when, in fact, it began at 2:30 p.m.) Finally, we are persuaded that the Broughton-Keaten telephone call took place on the morning of March 30th because Mr. Keaten's recording in his notes reflecting that a specific primary core coolant sample and its reading had been taken "last night" (TMIA Exh. 10, at 14) was confirmed subsequently in NUREG-0600 as having been conducted at 4:15 p.m. on March 29, 1979. Joint Exh. 62, Appendix II-A, at II-A-59.

- (c) There were discussions among the GPUSC engineers on March 28th indicating that they suspected a bubble somewhere in the system and discussions on March 29th indicating that the bubble was noncondensable gas rather than steam. TMIA alleges that the references to a bubble in the reactor and to noncondensables in Mr. Keaten's notes evidence that the telephone conversation with Mr. Broughton took place on March 29th.

TMIA Proposed Findings 220-221. However, TMIA's citations to the record do not show that Mr. Keaten had been informed prior to March 30th about a hydrogen bubble in the reactor.

- (d) The 1000-ft³ calculation in the notes was an earlier, rougher calculation than the 1500-ft³ calculation made by Messrs. Lowe and Moore on the night of March 29th.

TMIA Proposed Finding 221, n.3. This is erroneous. Mr. Lowe initially calculated a bubble size of 1568 ft³ at 2:45 a.m. on March 30th and thereafter, at 3:30 a.m. on March 30th, calculated a bubble size of 1100 ft³ Lowe, ff. Tr. 28,151, at 12. It appears that Mr. Keaten's notes reflected a rounding off of this second calculation.

- (e) The primary system pressure and temperatures recorded in Mr. Keaten's notes were measured at 6:30 p.m. on March 29th as is evidenced by TMIA Exh. 2 at 5.

TMIA Proposed Finding 221, n.23. However, as the Licensee points out, no evidence was adduced showing that these temperatures were unique to March 29th and did not exist also on March 30th as well.

46. We conclude that the probative evidence establishes that Mr. Broughton briefed Mr. Keaten on the information contained in the latter's notes on the morning of March 30, 1979, and that Mr. Keaten relayed this information to Mr. Dieckamp that same morning.

5. Mr. Dieckamp's Understanding of Core Damage

47. We are convinced from the findings of this section, *supra*, and § IV, *infra*, that Mr. William Lowe was the first person to recognize the significance of the March 28, 1979 containment building pressure spike; and that that recognition occurred during the late evening of March 29 and the early morning hours of March 30, 1979.⁷ But TMIA argues that Mr. Dieckamp's awareness of core damage on March 28 and 29, 1979, demonstrates his early awareness of a hydrogen burn in the containment building. TMIA Proposed Findings 228-236.

48. Mr. Dieckamp testified that he met with Mr. Arnold on the morning of March 29 for the purpose of formally establishing the Task Force to investigate the TMI-2 event of the previous day. Dieckamp, ff. Tr. 28,316, at 8. TMIA characterizes that meeting as one in which Dieckamp advised Arnold of serious core damage. TMIA Proposed Finding 228. Mr. Arnold substantiated that such a meeting and discussion took place, but with respect to serious core damage stated: "If someone wanted me to quantify it, I would say half a percent or a percent failed fuel type situation." Joint Exh. 84, at 25. The Board finds this to be far short of the extent of awareness on the part of Messrs. Arnold and Dieckamp alleged by TMIA.

49. TMIA refers to the briefing given to the Task Force on the afternoon of March 29, 1979, by Mr. Wilson, in which Wilson tells the Task Force of core damage to the extent of \$30 million. Since the chain of command was Wilson to Arnold to Dieckamp, TMIA concludes that Mr. Wilson's knowledge could only have come from Messrs. Dieckamp and Arnold. Hence, according to TMIA, Mr. Dieckamp must have been

⁷ In § IV.B, *infra*, we find incredible Mr. Chwastyk's statement of September 4, 1980, to the effect that on March 28 he quickly identified the pressure spike as a hydrogen explosion produced by a zirconium/water reaction. See Joint Exh. 117, at 27.

aware of the true seriousness of the core damage. TMIA Proposed Finding 231. We have previously dealt with each of these communication scenarios. We conclude that they are not supportive of TMIA's position regarding Mr. Dieckamp's awareness.

50. Finally, TMIA asserts further corroboration that Mr. Dieckamp understood the serious nature of the accident on March 28, 1979, from the contents of a memorandum written to Dieckamp on March 29 by Mr. B.H. Cherry, who was then Vice President for Planning of the GPU Service Corporation, and who reported directly to Dieckamp. TMIA Proposed Findings 232-235. Licensee points out that the Cherry Memorandum (TMIA Exh. 5) focuses primarily upon Mr. Cherry's perception of communication inadequacies on the day of the accident. Licensee Reply Findings 55 and 56. We agree.

51. The Cherry Memorandum stated that the communication difficulty persisted "until I spoke to you and got your view of the state of the reactor, etc. I think it was really only at that point that I had the full understanding of the situation and the condition of the plant." TMIA Exh. 5, at 2. TMIA would have us conclude from this statement of Mr. Cherry that: "This would be true only if Dieckamp were in fact informed of the high incore temperature readings and the hydrogen burn which would lead him to the correct assessment that TMI-2 had suffered serious core damage." [Footnote omitted.] TMIA Proposed Finding 235. The most that the Board can conclude from this is that Mr. Cherry believed that Mr. Dieckamp had provided Cherry the best account that Cherry had been able to obtain by the time the memorandum was written. We can find no probative evidence here or elsewhere to establish that the Dieckamp-to-Cherry communication reflected an awareness on Mr. Dieckamp's part of the true and actual extent of core damage on March 28, 1979. In fact, Mr. Dieckamp's own account of his awareness of core damage, as of March 29, concludes with the statement: "I certainly had no sense at all of massive reaction of zirconium with the water, oxidation and scalding, falling apart." Tr. 28,344 (Dieckamp). We find nothing that impugns the credibility of that statement and we accept it as fact.

IV. WHETHER ANYONE ON MARCH 28, 1979, INTERPRETED THE PRESSURE SPIKE AND CONTAINMENT SPRAY ACTUATION IN TERMS OF REACTOR CORE DAMAGE

A. Introduction

52. In this section we deal with the second prong of TMIA's case which, in effect, alleges that the significance of the pressure spike and the initiation of the containment spray pumps was well understood at the time of the spike and throughout the day on March 28, and that this understanding was widespread among the people gathered on the island that day. Here too we comply with the Appeal Board mandate to determine "whether *anyone* interpreted the pressure spike and containment spray, at the time, in terms of core damage [emphasis in original]" and whether "any such information [was] withheld." ALAB-772, 19 NRC 1193, 1267 n.103, 1268.

53. Our emphasis is on those who were working in the control room at the time of the pressure spike at 1:50 p.m. and during the following hours. We focus on four persons in particular whose early statements or role in the accident more than any other factors, gave rise to the issue of whether Mr. Dieckamp was truthful in his mailgram: (1) Joseph Chwastyk, a shift supervisor, who once stated that, on March 28, he interpreted the pressure spike and spray actuation in terms of hydrogen combustion, zirconium/water reaction and core damage; (2) Brian Mehler, another shift supervisor, who realized that the pressure spike was real soon after it occurred, and who once stated that, on March 28, an order was given to avoid starting electrical equipment to prevent the ignition of any combustible gas (presumably hydrogen); (3) Theodore Illjes, a control room operator, who once stated that a hydrogen explosion had been discussed on March 28; and (4) Gary Miller, TMI Station Manager and Emergency Director at the time of the spike, to whom any such information might be imputed, and who was in direct communication with Mr. Dieckamp within an hour after the pressure spike.

54. We conclude below that Mr. Chwastyk's memory has been hopelessly influenced by after-acquired information; that Mr. Mehler, after careful reflection, came to the conclusion that the order to avoid ignition of hydrogen was not issued on the 28th; that Mr. Illjes has a very poor memory of the timing of events; and that there is no reliable evidence that Mr. Miller was even aware of the pressure spike, let alone its significance on March 28.

B. Joseph J. Chwastyk

55. Mr. Joseph J. Chwastyk is very important to the resolution of the mailgram issue. A TMI-2 shift supervisor with 10 years' TMI experience in 1979, Mr. Chwastyk was present in the control room at 1:50 p.m. on March 28 and actually observed the rise and fall of the containment pressure strip chart recorder pen at the time of the pressure spike. Mr. Chwastyk is the only person to claim that on March 28, 1979, he knew that the pressure spike and containment spray actuation were caused by hydrogen combustion and that the hydrogen was generated by a zirconium/water reaction and that the zirconium/water reaction meant damaged zirconium cladding and core damage. Moreover, Mr. Chwastyk states that he imparted a substantial amount of this information to Station Manager Gary Miller soon after the pressure spike. If Mr. Chwastyk's account of these events is correct — or more precisely, if TMIA's selection of Mr. Chwastyk's several accounts, is correct — it would be likely that Mr. Dieckamp had knowledge of some evidence that the pressure spike and containment spray actuation was, on March 28, 1979, thought to be indicative of core damage. Mr. Chwastyk's various accounts of the pressure spike and its implications cover virtually every area of dispute about the knowledge possessed by those in the control room on March 28.

56. By way of background to the findings in the following paragraphs, Mr. Chwastyk testified that he saw the actual pressure recorder going straight up, but that initially he did not know what was happening. He noted that the containment spray pumps came on. The pressure came back down and looked like it was staying there, so he ordered the spray pumps secured. Then he ordered an external check of the reactor building and ordered the control room operators to verify containment integrity. He testified that "eventually" he came to the conclusion that the pressure spike did in fact indicate a real increase in pressure after discussing the cause of the spike with Brian Mehler. He then discussed the pressure spike with Station Manager Gary Miller. He testified that he told Mr. Miller that he thought there had been a real pressure increase. He does not now recall mentioning hydrogen or core damage to Mr. Miller and is uncertain whether he mentioned that there had been an explosion. Nevertheless, Mr. Chwastyk testified that at the time of his conversation with Mr. Miller, Mr. Chwastyk's understanding of the pressure spike was that it was caused by a hydrogen buildup from zirconium/water reaction in the core. According to Mr. Chwastyk, he asked and shortly thereafter received permission from Mr. Miller to "draw a bubble" in the pressurizer. Mr. Chwastyk also testified that, to avoid

sparks, he ordered that the electrically operated pressurizer relief valve not be operated and testified that a similar but general order was given later in the evening. Mr. Chwastyk also testified that he discussed the pressure spike with an NRC representative, but cannot recall if he told him that there had been a hydrogen explosion. He stated that he discussed the pressure spike with operators who later came on shift. He believes he told them the pressure spike indicated a real increase in pressure and may have discussed hydrogen and zirconium/water reaction with them.

Before the Pressure Spike

57. On March 28, 1979, Mr. Chwastyk was a shift supervisor licensed on both units and was scheduled for the three-to-eleven shift at TMI-2. He came to the station early, about noon, because he had heard about the accident. He received an informal briefing when he reported to the Unit 2 control room sometime before 1:00 p.m. His testimony is vague on the point, but he believes that the prevailing impression at that time was that there was some "sort of core damage" based upon temperature and radiation readings. Tr. 29,112-13 (Chwastyk). Mr. Chwastyk, himself, did not know "for a fact" that there was core damage, but believed that there had been. Tr. 29,189 (Chwastyk);⁸ see also Tr. 29,325-26 (Chwastyk).

58. In any event, Mr. Chwastyk did not think in terms of zirconium/water reaction prior to the pressure spike (Tr. 29,346 (Chwastyk)).

59. Mr. Zewe was the shift supervisor on duty at the time of the accident that morning and was still on duty when Mr. Chwastyk arrived at Unit 2. Mr. Chwastyk saw that Mr. Zewe was very busy on other matters, so Mr. Chwastyk took over the actual direction of the operators. Mr. Gary Miller was in overall charge of Unit 2. Mr. Chwastyk could not describe the direct reporting line, but there was a standing order that Mr. Miller was to approve any changes in operation. Tr. 29,118 (Chwastyk). There were no existing procedures to govern the plant status. Tr. 29,124 (Chwastyk).

⁸ Later in his testimony, Mr. Chwastyk was much more explicit about his appreciation of core damage before the pressure spike. He specifically recalled radiation levels, specifically in the reactor building; water that had flooded into the auxiliary building was radioactively "hot"; and that there had been a loss of the reactor coolant pumps. Those signs, and others, according to his later testimony, indicated to Mr. Chwastyk that "in fact there was core damage" prior to the spike. Tr. 29,366 (Chwastyk).

The Pressure Spike

60. Something, perhaps alarms, alerted Mr. Chwastyk and he happened to be standing near the reactor building pressure recorder at 1:50 p.m., the time of the spike. He saw the recorder indicator go straight up and then down again. Some alarms went off, but Mr. Chwastyk cannot recall which. He does, however, recall that the reactor building spray pumps came on. Tr. 29,124-26 (Chwastyk). Prior to the spike everything had been fairly quiet, but with the alarms and operator actions connected with the spike, Mr. Chwastyk assumed that everyone (as many as twenty people) in the control room was aware of the pressure spike. Tr. 29,124-27, 29,174 (Chwastyk). One or two others may have actually seen the strip-chart pen rise and fall. Tr. 29,175 (Chwastyk). Mr. Chwastyk did not hear the "thud" heard by others at the time of the hydrogen detonation. Tr. 29,132 (Chwastyk).

61. The timing of the awareness that there had been a real rise in the reactor building pressure (as compared to signal anomalies) at the time of the strip-chart indication and the spray pump initiation is the first of several events giving rise to the question about the accuracy of Mr. Chwastyk's memory of the relevant episodes. Those who doubt Mr. Chwastyk's accounts suggest that his memory has become suspiciously and increasingly sharper with the passing of time.

62. At the time of his first interview on May 21, 1979, there was not the same focus on the pressure spike and its significance as there was after the issue of information flow had surfaced. At the beginning, Mr. Chwastyk stated that he did not know initially whether the spike existed in the sensors or in the building itself. He recognized, however, that the spray pumps had come on. Since he did not know what caused the spike indication, he delayed securing equipment, particularly the spray pumps. Joint Exh. 35, at 9. During the May 21 interview he did not state how long after the spike before he came to the realization that it was real.

63. Interviewed again on the point on October 11, 1979, Mr. Chwastyk stated again that he did not know at the time that the spike was an explosion.⁹ It was not until "sometime later" but on the same shift, that he associated the noise heard by others with the pressure spike on the strip-chart recorder. Then he knew there had been some "kind of explosion in the building." Joint Exh. 88, at 19. And, consist-

⁹ Mr. Chwastyk has used the terms "detonation," "explosion," and "combustion" interchangeably since he first began discussing the matter. We see no significance in the varying use of the terms, and we differ with Licensee on that score. Mr. Chwastyk is not certain whether the term "explosion" was ever used on March 28. Joint Exh. 117, at 105-06.

ently, on October 30, 1979, he told the Special Inquiry Group that he initially did not attribute the spike to a real pressure excursion and that he had considered the possibility of an electrical malfunction. Joint Exh. 117, at 5. Again, Mr. Chwastyk believed he became aware that the spike was real "sometime later." As between afternoon or evening, it was, he thought, "before the evening" when he "put it together." *Id.* at 11.

64. At the hearing, Mr. Chwastyk testified that he "eventually" came to the conclusion that the spike was real. But he said that, in terms of "real time," it was not very long after the event that he appreciated that it was an actual pressure spike. Tr. 29,130 (Chwastyk). Later, on cross-examination, Mr. Chwastyk explained that he became aware that the spike was real apparently sometime during the 6 minutes he allowed the containment sprays to operate. He reported to Mr. Miller just after securing the spray pumps. Tr. 29,318-19 (Chwastyk).

65. The Board has difficulty reconciling Mr. Chwastyk's use of the term "sometime later" in his October 11, 1979 interview, his October 30, 1979 recollection that it was "sometime later" but "before the evening," and his testimony that he "eventually" realized the spike was real, with his final testimony that the realization came within a few minutes after the strip-chart indication. Even allowing for a distortion of time perception because of excitement, his earlier statements are inconsistent with his final testimony at the hearing.

66. We have even greater difficulty reconciling Mr. Chwastyk's final testimony that, not only did he know the spike was real within a few minutes, but he also knew it was a zirconium/water, hydrogen explosion that early (Tr. 29,372 (Chwastyk)), as we discuss below.

67. The Board noted other inadequacies in Mr. Chwastyk's memory as to how he became aware that the spike was real. His early memory, on October 11, 1979, was that he "put two and two together," i.e., the pressure spike and the noise, and then he realized there had been a detonation. He also believed that the detonation correlated with the actuation of one of the valves, which valve he could not then specify.¹⁰ Joint Exh. 88, at 19. At the hearing, he initially, and for the first time, explained that the actuation of the spray system and its "two-

¹⁰ Even though, on October 11, 1979, Mr. Chwastyk could not identify the valve he thought corresponded to the detonation, earlier, on May 21, he referred to it as an "electromagnetic relief valve." Mr. Chwastyk has frequently referred to the now-famous pilot-operated relief valve (PORV) as an "electromagnetic relief valve" or "EMOV." Others have referred to the same valve (operated by a solenoid) as an "electromatic operated valve" (also "EMOV") or "motor-operated valve" ("MOV"). Tr. 29,334. We have generally used the somewhat redundant term "EMOV valve." This valve has a downstream block valve. We interpret Mr. Chwastyk's October 11 statement to mean that he did not know whether it was the actuation of the EMOV or its block valve which corresponded to the detonation. At other times, he was more confident that it was the EMOV valve.

out-of-three" logic (two of three pressure sensors are required to actuate each pump) convinced him that the spike was real. Tr. 29,130 (Chwastyk). The sensor-logic explanation materialized in a conversation with Mr. Mehler. Tr. 29,317 (Chwastyk).

68. Later in his testimony he believed that it was the combination of the noise and the actuation of the EMOV or its block valve, that led him to the conclusion that the spike was real. Tr. 29,319, 29,331 (Chwastyk).

69. The varying accounts of how Mr. Chwastyk concluded that the pressure spike was in fact some sort of detonation are confusing, but an explanation could be that the seemingly different accounts are each incomplete. Our greater concern is that, in his four interviews and in his hearing testimony, Mr. Chwastyk may have accepted incomplete and not fully accurate statements of the events put to him by his questioners.

Identification of Hydrogen and Core Damage

May 21, 1979 Interview

70. In his May 21, 1979 interview by the NRC, Mr. Chwastyk made no mention of hydrogen. Joint Exh. 35. He later explained that he simply was not asked about hydrogen then. This is true. However, he was asked to express himself about any observations from his experience which might be helpful to other plants. He had nothing to say. Joint Exh. 35, at 54-55. The Board has carefully read Mr. Chwastyk's May 21 statement. If, as Mr. Chwastyk later testified, he fully understood the implications of the failed fuel cladding, zirconium/water reaction on March 28, 1979, that understanding should have been apparent on May 21. In fact, one cannot determine from his May 21 statement that Mr. Chwastyk inferred anything at all about core damage from the pressure spike. But the question never came up.

71. On the other hand, by that time Mr. Chwastyk probably knew, as did many people, that there had been a hydrogen detonation and that the hydrogen had been produced by failed zirconium cladding in the core. Therefore, at least as of May 21, 1979, Mr. Chwastyk's memory did not seem to be influenced by any after-acquired knowledge.

72. Mr. Chwastyk's May 21, 1979 interview is significant to the Board in several respects:

- (a) Although not beyond belief, it is unlikely that, if on March 28, 1979, Mr. Chwastyk possessed all of the information concerning zirconium/water reaction and hydrogen buildup to the extent that he later recalled, some of that information should have appeared in the May 21 interview;

(b) Assuming that Mr. Chwastyk did in fact possess such knowledge, it is unlikely that he had communicated it to the extent he later recalled because, by May 21, 1979, the NRC had already interviewed most of those present in the control room on March 28 (e.g., Joint Exh. 12 — 33). Yet the three NRC inspectors who interviewed Mr. Chwastyk on May 21, 1979, did not allude to the very important information that Mr. Chwastyk today believes he possessed and communicated on March 28.

(c) The first recorded statement by Mr. Chwastyk was made after the mailgram and even then it provided no information inconsistent with the mailgram.

73. We believe that it is also significant that, on May 21, Mr. Chwastyk provided no more information about his report to Station Manager Gary Miller, other than Mr. Chwastyk's suggestion to Mr. Miller that the "electromagnetic relief valve" not be cycled. Joint Exh. 35, at 18.

October 11, 1979 Interview

74. Mr. Chwastyk was interviewed by four members of the Special Inquiry Group on October 11, 1979. For the first time Mr. Chwastyk alluded to "the hydrogen detonation or combustion." He referred to the phenomenon in a context which assumes that the interviewers already were familiar with it; not in the context that on March 28 Mr. Chwastyk had been aware of hydrogen combustion. Joint Exh. 88, at 6.

75. Later in the October 11 interview, Mr. Chwastyk stated that "I again went to Gary Miller and explained what I thought had happened as far as hydrogen detonation and the simultaneous opening of the valve. . . ." *Id.* at 18. This suggests that, on October 11, Mr. Chwastyk recalled that, on March 28, he informed Mr. Miller about Chwastyk's awareness of a hydrogen detonation. However, immediately after that statement, Mr. Chwastyk stated that he "just can't remember" whether he related to Mr. Miller his thoughts at the time about correlating the pressure spike with the valve operation. *Id.* at 22.

76. Mr. Chwastyk explained during the October 11 interview that he was "not that well acquainted with hydrogen or any other gases for that matter" and that, because he had seen the initial spike, he was nervous about hydrogen gases. *Id.* at 36. Indeed, we cannot discern from the October 11 interview that Mr. Chwastyk understood the zirconium/water reaction at that time, let alone on March 28. He does not refer to it.

77. The Board has compared Mr. Chwastyk's statement on October 11, 1979 to the effect that he had explained his thoughts about hydrogen detonation to Mr. Miller on March 28 with other portions of his statement that day and with his testimony later. We believe that the most logical explanation is that, by October 11, 1979, Mr. Chwastyk had begun referring retrospectively to the pressure spike as the "hydrogen detonation" or "hydrogen explosion."

October 30, 1979 Interview

78. The Special Inquiry Group interviewed Mr. Chwastyk again on October 30, 1979, after having reviewed his October 11 statement. This time there was no question about Mr. Chwastyk's assertion. In response to specific questions, he stated in certain terms that he knew there had been a hydrogen explosion on March 28 before he reported his concerns about the pressure spike to Gary Miller. Joint Exh. 99, at 14-15. Mr. Chwastyk felt sure that he had discussed hydrogen with Brian Mehler on March 28 but doesn't remember the conversation. *Id.* at 17. He recalled on October 30 that he mentioned "some sort of explosion" to Gary Miller at the time but was not sure that he attributed it to hydrogen. *Id.*

79. Then the Special Inquiry Group, apparently aware of the special importance of Mr. Chwastyk's statement about hydrogen, came directly to the point. The interviewer explained to Mr. Chwastyk that the Group had not discovered any general appreciation on Wednesday, March 28, of hydrogen, and that the general appreciation did not materialize until Thursday afternoon or night or Friday morning. *Id.* at 17-19. In fact the Special Inquiry Group apparently had not found anyone with an understanding on March 28 of the fact that there had been any sort of explosion, let alone one produced by hydrogen. Yet, as the interviewer pointedly explained, Mr. Chwastyk seemed to have arrived at the hydrogen conclusion on Wednesday afternoon. The interviewer further observed that Mr. Chwastyk had stated that others about him probably knew about the hydrogen then. *Id.*

80. Mr. Chwastyk conceded that he may not have told Mr. Miller about the hydrogen explosion or any explosion at the time of his report to Miller on the 28th. *Id.* at 20, 28. Mr. Chwastyk nevertheless insisted that he told others in the control room about it — probably counterparts to Chwastyk himself. *Id.* at 20. He also stated that he had reported to someone from the NRC that day that there had been some sort of explosion. *Id.* at 21. He was not, however, able to state the names of those with whom he discussed hydrogen or the explosion (Joint Exh. 99, *passim*) with the possible exception of Brian Mehler (*e.g.*, *id.* at 17, 19).

September 4, 1980 Interview

81. At the direction of NRC Chairman Ahearne, the Office of Inspection and Enforcement (IE) began an investigation into questions about the adequacy of information transfer between the Licensee and the NRC following the accident. NUREG-0760. The IE team, headed by Mr. Norman Moseley, interviewed Mr. Chwastyk on September 4, 1980. Joint Exh. 117. The IE team focused sharply on Mr. Chwastyk's asserted knowledge on March 28 of a hydrogen explosion.

82. Mr. Chwastyk's memory of the event appeared to be sharper than ever before, especially respecting his understanding on March 28 of the significance of the pressure spike. He stated that, after the explosion, it dawned on him that "we did, in fact, have some core damage in there because zirconium/water reaction created the hydrogen." This is the first mention by Mr. Chwastyk of the zirconium/water reaction. He recalled that it made him nervous. *Id.* at 24. Mr. Chwastyk said he knew on the afternoon of March 28 that the core had heated up enough to cause the zirconium/water reaction. *Id.* He knew also that the hydrogen came from one place — the zirconium/water reaction in the core. Mr. Chwastyk imputed to Gary Miller a serious attitude about the matter based upon Chwastyk's report to Miller. *Id.* at 26. Most importantly, Mr. Chwastyk told the IE team:

It was shortly after the actual explosion and the pressure spike in the building that I surmised that it was, in fact, an explosion and probably a hydrogen explosion, and I related that to Gary. This was prior to Gary leaving for the Governor's office, as far as I can remember.

Id. at 27.

Testimony at the Hearing

83. At the hearing, Mr. Chwastyk was examined extensively by the parties about what he knew on March 28, 1979, about the pressure spike, hydrogen, zirconium/water reaction and core damage; at what time he knew about them and to whom he imparted this information. He testified over 2 days. He had not read the transcripts of his previous interviews before his testimony on the first day. After the Board had concluded that his unaided memory of the events on March 28, 1979, had been tested sufficiently, we requested that he review the transcripts over the recess before appearing for the second day. He reported that his memory had been refreshed by his reading. Tr. 29,286 (Chwastyk).

84. Consistent with his September 4, 1980 statement to the IE team, Mr. Chwastyk stated that he understood when he reported to Mr.

Miller that the spike or explosion had been caused by a hydrogen buildup; that he knew there had been core damage; that the core damage produced a zirconium/water reaction in which hydrogen is freed. Tr. 29,141 (Chwastyk).

85. Mr. Chwastyk provided his final version of how thoroughly on March 28 he appreciated the significance of the pressure spike near the end of his testimony. He was queried by Licensee's counsel as to whether the combusted hydrogen could have been thought to be from a source such as the hydrogen used to scavenge oxygen in the reactor coolant water. Mr. Chwastyk immediately discounted that possibility by pointing out that the makeup tank, where scavenging hydrogen could be found, was in the auxiliary building, not in the reactor building where the detonation occurred. Tr. 29,372 (Chwastyk).

86. Then Mr. Chwastyk explained once again his version that he knew there was an explosion when the pressure spike indication happened simultaneously with the operation of the EMOV or block valve. *Id.* Simultaneously with that realization, Mr. Chwastyk knew that the explosion was from hydrogen, and, once he knew that it was a hydrogen explosion, he knew that it had to be from the zirconium/water reaction and *not* from the makeup tank. *Id.* If the Board were to accept this version of Mr. Chwastyk's account, we would then have to impute to Mr. Chwastyk a very thorough appreciation of the zirconium/water reaction and core damage within a few minutes after the pressure spike.

87. Mr. Chwastyk also testified that the zirconium/water reaction was an indication to him on March 28 that the core was damaged more than he thought was the case before the spike. Tr. 29,354-55 (Chwastyk).

Report to Gary Miller

88. With his analysis that there had been a zirconium/water reaction, a hydrogen explosion, and core damage fresh in his mind, Mr. Chwastyk reported to Station Manager Gary Miller.

89. As is well recognized, Mr. Chwastyk's report to Miller about the pressure spike would be the closest link connecting Mr. Chwastyk's March 28 understanding of hydrogen and core damage on that day to Mr. Dieckamp. Mr. Miller encountered Mr. Dieckamp soon after that report. There are two aspects to Mr. Chwastyk's testimony on this issue: (1) If, in fact, Mr. Chwastyk made any report to Mr. Miller, what does his report tell us about Chwastyk's understanding of the pressure spike; and (2) what did Mr. Miller understand from Mr. Chwastyk's report?

90. To revisit the sequence of events: The pressure spike happened at 1:50 p.m. Mr. Chwastyk allowed the containment spray pumps to run until he was satisfied that they should be secured. The time of securing the pumps has been established as 5 to 6 minutes after the spike by the Nuclear Safety Analysis Center. Joint Exh. 63, at 44, 45. Then Mr. Chwastyk discussed the two-out-of-three logic for spray pump actuation with Mr. Mehler. *E.g.*, Tr. 29,166 (Chwastyk). It was during this conversation that Mr. Chwastyk, in one of his accounts, came to the conclusion that the spike was real. Tr. 29,130, 29,317 (Chwastyk). Mr. Chwastyk then reported to Mr. Miller, who had to leave shortly thereafter to brief the Lieutenant Governor. Tr. 29,159 (Chwastyk).

91. The Special Inquiry Group estimated from the State log entry of his 2:30 p.m. arrival at the Lieutenant Governor's office that Mr. Miller left for the 30-minute trip soon after the spike. Joint Exh. 106, at 906. Mr. Miller believes he left the Unit at about 1:55 p.m. (Tr. 30,246 (Miller)), and Mr. Herbein believes he may have left (from off site) with Mr. Miller at 2:00 p.m. (Tr. 30,343 (Herbein)). Mr. Chwastyk believes that Mr. Miller left 15 minutes to a half-hour, perhaps less, after the spike. Joint Exh. 117, at 27.

92. By any account, Mr. Chwastyk's report to Mr. Miller was necessarily a short one. Mr. Miller does not remember Mr. Chwastyk's report. Tr. 30,204 (Miller). The report to Mr. Miller, according to Mr. Chwastyk, was after Chwastyk made a "bee line" to Miller's office. He followed Miller back to the control room in what has become known as the "moving conversation." *E.g.*, Tr. 29,170, 29,320 (Chwastyk).

93. Mr. Chwastyk testified that he told Mr. Miller that the spike was real and that it was primarily the spray pumps that supported that conclusion. Curiously, contrary to his repeated testimony at other times, he stated that he did not report the noise or thud heard simultaneously with the spike to Mr. Miller. Tr. 29,131 (Chwastyk). Nor did Mr. Chwastyk, during the account just cited, testify to his oft-repeated statement that he reported to Mr. Miller his view that the simultaneous operation of the EMOV or its block valve provided the basis for believing the spike was real. *Id.*

94. Contrary to his important September 4, 1980 deposition, Mr. Chwastyk testified that he could not recall whether he told Miller about his understanding that there had been a hydrogen explosion (Tr. 29,141, 29,358), or any explosion (Tr. 29,153 (Chwastyk)). *But see* Tr. 29,358 (Chwastyk). Mr. Chwastyk may not even have mentioned "hydrogen" to Miller, relying on the assumption that both he and Miller understood the presence of hydrogen. Tr. 29,154 (Chwastyk). But Mr. Miller said nothing to Chwastyk to indicate that he, Miller, understood

that the spike was caused by a hydrogen burn. Tr. 29,281 (Chwastyk). Mr. Chwastyk testified that he could not recall telling Mr. Miller about core damage during his report and doesn't believe that he did. Tr. 29,180, 29,281 (Chwastyk).

95. According to Mr. Chwastyk, whatever it was that he reported to Mr. Miller, it was not serious enough to distract Mr. Miller from other thoughts. Miller, getting ready to report to the Lieutenant Governor, was very busy. He responded to Mr. Chwastyk with the advice that they should not get excited. Tr. 29,159 (Chwastyk).

96. As noted, Mr. Miller said nothing to indicate an appreciation that the pressure spike was caused by hydrogen or that it indicated core damage. Tr. 29,281 (Chwastyk). In fact, Mr. Chwastyk never received any acknowledgment from Mr. Miller that Miller believed the pressure spike was real. Tr. 29,282 (Chwastyk). When questioned whether Mr. Chwastyk believed Mr. Miller was absorbing Chwastyk's report, or whether Miller may have been preoccupied with other things, Mr. Chwastyk explained that Mr. Miller was preoccupied and that Chwastyk was sure that Miller was thinking about other things. Tr. 29,321 (Chwastyk).

Chwastyk's Communication with Others

97. Mr. Brian Mehler, another shift supervisor at TMI-2, was also on duty at the unit at the time of the pressure spike. His account of the events is covered below in the next section. Here we are concerned with whether Mr. Chwastyk communicated to Mehler his understanding on March 28 of the hydrogen explosion and zirconium/water reaction.

98. Mr. Mehler was in the shift supervisor's office at the time of the spike, but left to go to the control console when he became aware of the increased activity and alarms. Tr. 29,475-76 (Mehler). In the important minutes that followed the spike, Mr. Mehler had a close working relationship with Mr. Chwastyk. As we noted above, it was Chwastyk's conversation with Mehler that, in one of Chwastyk's versions, led Chwastyk to realize the spike was real because of the two-out-of-three sensor logic for the containment spray pumps. *E.g.*, Tr. 29,166-67 (Chwastyk).

99. When interviewed on October 30, 1979, Mr. Chwastyk could not remember having a conversation on March 28 with Mr. Mehler about the causes of the spike, i.e., whether it could have been caused by a chemical explosion or by hydrogen. He believed then that he may have had such a conversation, and that, because Mehler was present, they probably did confer. Joint Exh. 99, at 7-8, 17.

100. By the time Mr. Chwastyk was interviewed by the IE team on September 4, 1980, he recalled definitely that, after the spray pumps were secured and matters had returned to a relatively normal state, he discussed the pressure spike with Mehler and that Mehler agreed with Chwastyk that there had been an explosion. Joint Exh. 117, at 6, 9-10, 26. There was, however, no reference to hydrogen or zirconium/water reaction in Chwastyk's 1980 account of his conversation with Mehler. *Id.*

101. At the hearing, Mr. Chwastyk testified again that he believed on March 28 that Mr. Mehler understood that there had been a real pressure spike. And again Mr. Chwastyk could not recall any discussion about hydrogen with Mehler. Tr. 29,167, 29,317 (Chwastyk).

102. In his testimony at the hearing, Mr. Mehler recalled a conversation of a few words with Mr. Chwastyk right after the spike. He corroborates Mr. Chwastyk's statement that he, Mehler, soon knew that the spike was real but does not recall that it was described as an "explosion." Mr. Mehler was quite specific in his belief that hydrogen was not discussed with Chwastyk on that date. In fact, Mr. Mehler recalls that he first learned about hydrogen in the newspaper. They discussed a possible chemical reaction but could not identify any source. Tr. 29,486-87 (Mehler). Nor was a zirconium/water reaction discussed at that time. Tr. 29,566 (Mehler).

103. Mr. Chwastyk testified that he discussed the pressure spike with members of the oncoming shift the afternoon or evening of March 28. These were Theodore Illjes, John Kidwell, and Chuck Mell.¹¹ While he cannot recall specifically, he thinks that he discussed hydrogen. Tr. 29,167-68, 29,337-38 (Chwastyk); *see also* Tr. 29,349-51 (Chwastyk). He may also have discussed the zirconium/water reaction with them. Tr. 29,356 (Chwastyk). Messrs. Illjes, Mell, and Kidwell have also been interviewed.

104. On July 14, 1979, Mr. Charles Mell stated that during the shift turnover they were shown the spikes and told that both building spray pumps had come on. He stated, however, "at that time they . . . hadn't really postulated why they had come on yet. No one really had the time to think about it." Joint Exh. 60, at 7. Mell stated that there was no discussion of hydrogen burn the first night and that it was not until the

¹¹ Mr. Chwastyk also indicated that either Bill Conaway or Carl Guthrie also came on shift with Illjes, Kidwell and Mell. Tr. 29,167 (Chwastyk). Mr. Conaway came on duty at 11 p.m. on March 28. We do not know when Mr. Guthrie came on duty. Mr. Chwastyk is probably mistaken about Conaway and Guthrie.

next day or night that someone postulated one. *Id.* at 11-12; Joint Exh. 69, at 17-18.

105. In a May 23, 1979 NRC interview, Mr. Theodore Illjes stated,

when it [the shift] was turned over it was mentioned that we did have a pressure spike, when we turned over. That was the only thing that was mentioned, and that they had recovered from a reactor building isolation.

Joint Exh. 36, at 8. Mr. Illjes, who testified, could not remember Mr. Chwastyk's briefing. Tr. 29,644-46, 29,653-54 (Illjes).

106. Mr. John Kidwell was interviewed by the Special Inquiry Group. The SIG Report, March 4, 1980, indicates that Kidwell's memory of Wednesday, Thursday, and Friday was blurred. Mr. Kidwell recalled that there was discussion late one night about the pressure spike and what caused it, but he did not know which day. Joint Exh. 107, at 61.

107. In his September 4, 1980 deposition, Mr. Chwastyk identified Donald R. Neely as the NRC inspector whom he had told the spike was real. He could not recall Neely earlier. Joint Exh. 117, at 104-05; *see also* Tr. 29,166 (Chwastyk). Mr. Neely, however, is certain that he was not informed of the pressure spike. Joint Exh. 130, at 8-13.

Draw a Bubble

108. Since as early as his October 11, 1979 interview, Mr. Chwastyk has maintained that, immediately after the pressure spike, and as a result of his understanding of it, he sought and received permission from Mr. Miller to "draw a bubble" in the pressurizer. Joint Exh. 88, at 7, 18. As Mr. Chwastyk later explained, drawing or establishing a bubble in the pressurizer would mean closing the pressurizer EMOV valve or block valve so that the water would not escape and by turning on the pressurizer heaters so that a steam bubble would form. Makeup flow would be increased. The purpose, according to Mr. Chwastyk, was to establish a familiar mode; to know with confidence from the pressurizer level what the coolant level in the system was; and to assure that the core was covered. This mode was contrasted by Mr. Chwastyk with cycling the EMOV or block valve, allowing water (or steam) to escape, thus not allowing a bubble to form in the pressurizer. Tr. 29,142-50, 29,288 (Chwastyk).

109. Drawing a bubble is not the same as the so-called "repressurization strategy" (Tr. 29,291 (Chwastyk)), a theory of the case much favored by TMIA. Mr. Chwastyk's request to draw a bubble, and Mr. Chwastyk's statement that Mr. Miller authorized that tactic is advanced

by TMIA as evidence that the significance of the pressure spike was fully appreciated by Chwastyk, Miller, and, in general, by others on March 28.

110. The difficulty with the theory is that no special relationship between drawing a bubble and the pressure spike has been demonstrated. Moreover, as Mr. Chwastyk himself concedes, he had requested permission to draw a bubble before the pressure spike and could not explain why the request after the spike differed from earlier requests except that he perceived a more pronounced need. Tr. 29,322-25 (Chwastyk). Also, as Licensee points out, at the time of the pressure spike, people were already working on the pressurizer trying to draw a bubble and to establish a level. Joint Exh. 2, at 11 (Faust); Joint Exh. 24, at 12-13 (Wright).

Chwastyk Prevents Sparks

111. At least one order, perhaps more, was given following the accident not to operate electrical equipment in the containment in order to prevent sparks which could ignite combustible gas. TMIA argues that the first order was given on March 28 soon after the pressure spike and that, therefore, there must have been an appreciation of hydrogen at that time. We discuss the spark-prevention strategy in greater detail in the section below on Mr. Mehler's testimony (where we find that the first order was given on March 29). In the following paragraphs we address Mr. Chwastyk's memory of the first spark-prevention order.

112. Beginning with his very first interview on May 21, 1979, Mr. Chwastyk alluded to his idea of the relationship between the "electromagnetic relief valve" (EMOV) and his assumption that there had been an explosion. Mr. Chwastyk stated then that he suggested to Miller that the valve no longer be cycled. Joint Exh. 35, at 18. During his second interview, October 11, 1979, the interviewers pressed Mr. Chwastyk to be careful about whether he told Miller that he, Chwastyk, thought that opening the valve had caused an explosion. Mr. Chwastyk responded that, while he was sure that he had that cause and that effect in mind at the time, upon thinking about the matter, he could not remember telling Miller about his theory. Mr. Chwastyk may have stated to Miller only another request to draw a bubble. Joint Exh. 88, at 21-22.

113. A few weeks later, during his third interview, Mr. Chwastyk was again requested to state his best recollection about what he told Mr. Miller about his spark theory during that report. On this occasion, Mr. Chwastyk stated that he had thought about that matter, and that he did go to Mr. Miller with his thoughts about the sparks and the valve operation. Joint Exh. 99, at 13-14.

114. The question arose again during the September 4, 1980 interview by the IE team where the team alluded to Mr. Chwastyk's first testimony on May 21, 1979 (when Chwastyk had recommended that the EMOV not be operated). The interviewers wanted to know why Mr. Chwastyk's recommendation was limited to the EMOV. Mr. Chwastyk responded that in fact there had been an order put out not to operate other equipment and that he "sort of kicked" himself "for not thinking of it." Joint Exh. 117, at 15-16.

115. At the hearing, Mr. Chwastyk testified, for the first time, that the first order not to operate equipment was issued by Chwastyk himself after a discussion with Mr. Miller and that the order pertained to the EMOV or block valve. Tr. 29,152-53, 29,285 (Chwastyk); *see also* Tr. 29,332 (Chwastyk). He explained also that his "kicked myself" statement was not inconsistent with his current testimony. According to Mr. Chwastyk, his first order was limited to the EMOV because that was the only item being operated. Tr. 29,332 (Chwastyk). When the later order covering all electrical equipment came out, Mr. Chwastyk realized that he should have anticipated that other equipment might be used. Therefore, he "sort of kicked myself." Tr. 29,344-45.

116. The Board disagrees with Licensee's proposed findings on this point. Licensee Reply Findings 92, 93. Mr. Chwastyk's explanation about overlooking other electrical equipment, thinking only about the EMOV, is consistent with his earlier interviews as he explained during the IE interview of September 4, 1980. Joint Exh. 117, at 15-16, *supra*.

117. We are, however, troubled by the recurring phenomenon of Mr. Chwastyk's memory improving over time. From no early mention of the fact that he, Chwastyk, had given the order not to cycle the EMOV, and uncertainty whether he had even discussed the matter with Mr. Miller, Mr. Chwastyk came to the hearing confident that the order was issued by Chwastyk himself after consultation with Mr. Miller.

118. When deposed before the hearing on September 24, 1984, Mr. Chwastyk stated that it was Mr. Miller, not Chwastyk, who gave the order not to operate the EMOV. Tr. 29,284-87 (Chwastyk) (deposition not in evidence). But having since refreshed his memory by reviewing all of the depositions (at the Board's request), Mr. Chwastyk arrived at his present view that the order was given by Chwastyk after consultation with Mr. Miller. Yet, as we have recounted above, Mr. Chwastyk's earlier depositions and interviews were much less specific on the matter than is the memory they refreshed. And of course, we must consider the fact that no one else has ever mentioned Chwastyk's order not to

operate the EMOV or block valve. Mr. Miller does not recall any discussion of Mr. Chwastyk's account. Tr. 30,204 (Miller).¹²

Board Conclusions on Mr. Chwastyk's Testimony

119. The Board concludes that, on March 28, 1979, Mr. Chwastyk did not interpret the pressure spike and the actuation of the containment spray pumps in terms of hydrogen combustion and core damage. His testimony and previous statements to that effect are not reliable. We also conclude that Mr. Chwastyk's testimony is probably consistent with his understanding of the truth. But his memory of events has been influenced by after-acquired information.

120. Mr. Chwastyk probably understood on March 28 that the pressure spike was real. Mr. Mehler corroborates this. As of May 21, 1979, his first statement on the matter, he had already associated in his memory the cycling of the EMOV (or the block valve) with the pressure spike. Therefore, by that time, he may have had a memory that on March 28 he knew that there had been an explosion or detonation. But the record is not reliable on that point, because he refers solely to the simultaneity of the spike and the valve cycling without reference to sparks.

121. The Board was influenced by the fact that, as a trend, Mr. Chwastyk's memory seemed to improve over time. But this was not always the case. For example, he was less certain about what he had reported to Mr. Miller and to the oncoming shift in his hearing testimony than in some earlier statements. Nevertheless, there were too many inconsistencies in Mr. Chwastyk's accounts of the relevant episodes for the Board to accept any of the various versions over any other. His account that he understood on March 28 that there was a hydrogen combustion which derived from a damaged core and degraded zirconium cladding and that he communicated the essence of this information to others is not corroborated by those to whom he believes he spoke. Nor is it corroborated by the record of events.

122. In sum, we find that on March 28, 1979, Mr. Chwastyk did not believe, as an interpretation of the pressure spike and spray actuation,

¹² In two early interviews, Mr. Mehler stated that "either the same day or two days later" there was a discussion of the source of ignition. First he thought it had been the pressurizer vent valve (Joint Exh. 32, at 32) and later the pressurizer block valve (Joint Exh. 68, at 8). But Mr. Mehler has never mentioned Mr. Chwastyk's order not to cycle the EMOV or block valve in his several statements about when the first order not to operate electrical equipment was issued. See the discussion of operating electrical equipment in connection with Mr. Mehler's testimony below; see also Joint Exh. 36, at 9-10 (Hjes).

that there was core damage (more severe than believed before the spike), *nor* did he believe that any such core damage produced hydrogen by a zirconium/water reaction, *nor* did he then believe that the pressure spike was a hydrogen combustion. *Nor* did he communicate any such information to anyone on March 28. Since we do not find that any of those links occurred, the possibility that they all occurred is extremely remote.

123. Moreover, even if we were to believe that Mr. Chwastyk appreciated the full significance of the pressure spike, and, assuming further, that he spoke about some or all of this information to Mr. Miller, Mr. Chwastyk's testimony was that Mr. Miller was not paying attention to Mr. Chwastyk during the report. Indeed, Mr. Miller's immediate departure to brief the Lieutenant Governor after Chwastyk's report is a strong indication that Mr. Miller had not received any such information from Chwastyk.

124. It is not necessary that we understand why Mr. Chwastyk made statements inconsistent with the reliable evidence. However, since those statements constitute the main collection of accusations — by others, not Chwastyk — against Mr. Dieckamp, some additional observations about Mr. Chwastyk might be helpful.

125. He was not a volunteer. He appeared under subpoena. He carries no brief against Mr. Dieckamp. He stated that he is sure that Mr. Dieckamp did not know what Chwastyk knew during the accident. Tr. 29,421 (Chwastyk).

126. The Board and the parties have had the opportunity to ponder deliberately the transcripts of Mr. Chwastyk's testimony and various statements. We have read exquisite analyses of virtually every subtlety and nuance in the differing accounts. Yet, Mr. Chwastyk's testimony and depositions have been on-the-spot oral answers months and years after the events.

127. As Mr. Chwastyk explained, there has been an overanalysis of his answers. He does not have the verbal skills of the lawyers who have questioned him. His meanings have not always been accurately understood by his questioners. Tr. 29,420-21 (Chwastyk). He points out that information is missed in transcribing the depositions; the tone of the question; some possible facial expressions. Tr. 29,420 (Chwastyk). We are sympathetic to that observation. As we noted during the hearing, his demeanor was frequently consistent with uncertainty — a shrug of the shoulders for example. Tr. 29,190-91. Yet this uncertainty may not be evident in the raw language of the transcripts.

128. Mr. Chwastyk acknowledged that he has learned a lot since the accident and doesn't know how much of that information could have

become confused with his memory of events. Tr. 29,314 (Chwastyk). He also acknowledged that he probably had less confidence in his understanding of the events on the day of the accident than he did during his testimony. Tr. 29,352-53 (Chwastyk).

129. He appeared to be cooperative with all participants regardless of their positions on the issues. He tried to provide information as best he could. This we see as a possible part of the problem — a willingness to provide information even though uncertain about it. All in all, we thought his summary advice to the Board was very constructive. He is not sure that 5½ years after the accident anyone can make total sense out of the events of March 28, 1979. Tr. 29,420 (Chwastyk).

C. Brian Mehler

130. As noted above Mr. Brian Mehler was, with Mr. Chwastyk, also a TMI-2 shift supervisor on duty at the time of the pressure spike. Noticing increased activity and the actuation of some alarms, Mr. Mehler went to the console. Tr. 29,475-76 (Mehler). The pressure recorder looked to him as if there had been an electrical fault, but shortly thereafter he saw that both containment spray pumps were running. Based upon the two-out-of-three sensor logic for the pumps (and an engineered safeguard (ES) signal), Mr. Mehler realized the spike was real. Tr. 29,479 (Mehler). After the equipment was secured, Mr. Mehler and Mr. Chwastyk "looked at each other" and mutually agreed that there had been a spike. They didn't know the cause — perhaps a chemical reaction. It was over, and there was no more that could be done about it. They went on with their work. Tr. 29,562-63 (Mehler); *see also* Tr. 29,487 (Mehler).

131. Mr. Mehler was examined thoroughly at the hearing about whether he appreciated or discussed the fact that there had been a hydrogen explosion on the 28th and he was quite specific that neither hydrogen nor explosion was understood or discussed on March 28th. Tr. 29,487, 29,563-66. Nor, of course, was zirconium/water reaction. Tr. 29,566 (Mehler).

132. Mr. Mehler has been interviewed or deposed at least six times since the accident.¹³ His earlier statements contain many references to the hydrogen explosion and other core damage indicators on March 28. Mr. Mehler has repeatedly explained that these references are products

¹³ These statements are in evidence: Joint Exh. 17, Met Ed interview (April 25, 1979); Joint Exh. 32, NRC interview (May 17, 1979); Joint Exh. 68, Hart Committee interview (August 22, 1979); Joint Exh. 89, NRC deposition (October 11, 1979); Joint Exh. 98, NRC deposition (October 30, 1979); and Joint Exh. 115, NRC interview (September 3, 1980).

of knowledge gained after March 28. Tr. 29,488, 29,490, 29,514, 29,564, 29,581 (Mehler). The Board has examined these statements, particularly the portions cited by the parties. With one exception, we find nothing inconsistent with Mr. Mehler's assertion that, on March 28, 1979, he did not know that the pressure spike and containment spray actuation was caused by a zirconium/water reaction, hydrogen explosion, or that anyone interpreted the spike or spray actuation in terms of core damage on that day.¹⁴

133. The exception we allude to is Mr. Mehler's prior statements concerning the timing of an order not to actuate electrical equipment.

Electrical Equipment

134. There is no dispute that, once hydrogen or an explosion was identified as the cause of the pressure spike, an order was given not to operate electrical equipment to prevent ignition by sparking. To support the theory that zirconium/water reaction, hydrogen and core damage were understood on March 28 TMIA cites statements by Mr. Mehler that the order not to operate electrical equipment was issued on March 28. We consider the entire subissue in the context of Mr. Mehler's statements.

135. When interviewed on August 22, 1979, by the Hart Committee, Mr. Mehler was asked if he heard anyone express any concern about energizing the block valve just prior to the pressure spike. He replied:

No. After the pressure — don't know exactly what the time element was after that. Since we did have an explosion, it needed a source of ignition. We assumed the ignition source could have been the block valve. If it was that same day or two days later I can't tell. I know it was discussed at some time or another.

Joint Exh. 68, at 8.

136. Mr. Mehler was again interviewed about the spark potential by the Special Inquiry Group on October 11, 1979:

Q What I'm trying to do is key in to some events on 3/28.

¹⁴ TMIA points to Mr. Mehler's August 22, 1979 interview by the Hart Committee (Joint Exh. 68, at 12) for a proposed finding that Mr. Mehler had indicated that he may have discussed hydrogen with Mr. Chwastyk. TMIA Proposed Finding 45. In that interview, Mr. Mehler stated "we were concerned but we couldn't determine if it was hydrogen or maybe we had some kind of chemical reaction that time." Joint Exh. 68, at 12. The entire discussion however indicates that hydrogen was not, as might be inferred, discussed as a possible source of the spike. Mr. Mehler stated in that same interview that no one realized that there could have been so much hydrogen; and that neither he nor anyone else had any idea at the time that the temperatures were high enough to produce a zirconium/water reaction. *Id.*

A Yes, you are trying to figure out if they told us not to operate [lift pumps] why we did.

Q Not really, I'm trying to figure out if someone told you not to operate electrical equipment in the containment, was that on 3/28 or 3/29?

A That was 3/28.

Q Why are you so sure?

A Because it was prior to the reactor cooling pump starting and we started that at 3/28 in the evening.

Q So that was contrary to the instruction that was issued?

A It was after the hydrogen burn and we had to get some kind of pump running, you know, you had the lesser of two evils.

Q Okay, well, I admit it has been six months ago since this occurred, but the last question on this is, is that in the control room log, it was on the three to eleven shift on the 29th, on swing shift around 2114 [9:14 p.m.] when the entry was made to place the pumps in the off position (minimize spark potential at reactor building). And as I understood, that in your memory, that is about when that instruction was given to you. So do you see why I have the question?

A I understand and I can say for a fact and I will go under oath and I will take a lie detector test, prior to running the reactor core pumps, someone did tell us not to start anything and I remember telling Gary, it's too late now I have already started them. And that was after the hydrogen spike.

Q Now the reason why you were not to start anything —

A Was a spark in case we did have hydrogen in there.

Q Okay. And you did not know who advised you of that?

A No, I don't.

Q Where did they think the hydrogen came from at that point in time?

A I don't know.

Id. at 24-25.

137. We have considered the possibility that, in the passage just cited, Mr. Mehler was attempting to explain that the order not to start electrical equipment came after the spike rather than before it, and that he was thinking of the starting of the reactor coolant pumps rather than the date. But other portions of the October 11 interview support the conclusion that Mr. Mehler then believed that, in fact, the order was given on the 28th. *See id.* at 15, 16.

138. On October 30, 1979, Mr. Mehler was interviewed again by the Special Inquiry Group about the order not to start electrical equipment. This time Mr. Mehler believed that the order was given by Mr. Miller from his office, but that he, Mehler, did not know what day the order

was given. He recalled that the order followed Mr. Mehler's testing of the lift and backstop pumps, a step necessary before actuating the reactor coolant pumps. The comment was made to the effect that since those pumps had been started (already sparked) there would not be any hydrogen left. Joint Exh. 98, at 11-12.

139. Referring back to the October 11 interview, Mr. Mehler was asked about what had made him then believe that the order was given on March 28. He responded that "because I remember starting the lift pumps and backstop pumps on March 28." However, he recalled starting those pumps also on the 29th. *Id.* at 13-14. Mr. Mehler explained that since the earlier interview, upon "thinking back upon it" he had become less certain that the order had been given on the 28th. He had talked to Messrs. Miller, Ross, Zewe, and Chwastyk, none of whom recalled the instruction being given on the 28th. He stated that Mr. Chwastyk in particular recalled the instruction being given on the 29th. *Id.* at 15-16.¹⁵ Mr. Mehler summarized the matter by stating that his own memory standing alone had been that the instruction was given on the 28th but that, in talking to the others, it is more likely to have been given on the 29th. *Id.* at 16-17.

140. On November 1, 1979, Mr. Mehler provided to the Special Inquiry Group transcript corrections to his October 11, 1979 deposition in a cover letter informing the Group that he was unable to state that the instruction not to operate electrical equipment occurred on March 28, 1979, or at some later date. Joint Exh. 89 (cover page).

141. Mr. Mehler was interviewed for the last time by the IE team on September 3, 1980. Mr. Mehler stated that the change in his opinion concerning the instruction not to operate electrical equipment was the result of having talked to people, having had the chance to review logs, and having had a chance to sit down, talk to his wife, and figure out where he was. Joint Exh. 115, at 23. He stated that, after 6 months, the 28th, 29th and 30th ran together. *Id.* at 21.

142. The control room log tends to support the position that the order not to activate electrical equipment remembered by Mr. Mehler and others was given on March 29. TMIA Exh. 16. The entry for 2114 hours (9:14 p.m.) on March 29 noted "Placed RCP [reactor coolant

¹⁵ Mr. Chwastyk remembered the conversation. He stated that he didn't want to talk to Mr. Mehler about it. He thinks that he may have made a comment to Mr. Mehler that he, Chwastyk, didn't think it happened on the 29th (in one answer) and that it didn't happen on the 28th (in another answer), but Mr. Chwastyk could not remember either way. Joint Exh. 117, at 38. Mr. Chwastyk was willing to defer to Messrs. Zewe and Miller on the point. *Id.* at 41. In an earlier interview, Mr. Chwastyk stated that he didn't believe that the order not to operate electrical equipment, particularly the lift pumps, was given on March 28th. Moreover he provided his reasons for tending to think the order was given later than the 28th. Joint Exh. 99, at 15-17.

pumps] lift pumps in off [position] (minimize sparking potential in RB)." TMIA Exh. 16, at 87. This entry indicated to Mr. Mehler that the lift pumps had been started in case it became necessary to start a reactor coolant pump. Tr. 29,531-33 (Mehler). Mr. Mehler acknowledged that this could have been the event that occasioned the instruction he remembered, though he is not certain. Tr. 29,578 (Mehler). No similar entry can be found in the log for March 28th. TMIA Exh. 16.

143. Mr. Mehler's testimony at the hearing was not very helpful, but, in general, it was consistent with his last two interviews. Tr. 29,507-34, 29,567-79 (Mehler). As he explained:

As time goes on, you know, from March 28th, it became harder to recall what actually I remembered, and what I was told about, read about, or found out about. It is very hard to differentiate between them.

144. Others who had a good opportunity to hear about any spark prevention strategy recalled either that it took place after the 28th or could not recall that it happened on the 28th.

145. Mr. Kunder testified that he gave such an order — to deenergize unnecessary equipment in the reactor building — to Mr. Bense after the Thursday meeting. Tr. 30,028-33 (Kunder); Joint Exh. 118, at 51-53. Mr. Zewe specifically recalled that the order was given sometime on the 29th. Joint Exh. 119, at 46. Mr. Ross stated that he was sure that the order was not given on the 28th; it was given either on the 29th or 30th. Joint Exh. 124, at 66-67.

146. NRC Inspector, Mr. Neely, present on March 28, did not hear any such order that day and it was not until much later that he heard about it. Joint Exh. 130, at 9-10. Similarly, NRC Inspector, Mr. Higgins, also present, did not learn about the spark prevention strategy until much later. Joint Exh. 129, at 30. Mr. Faust guessed that any such order would have been given on the 29th. Joint Exh. 133, at 17-18. Mr. Porter does not recall such a discussion on the 28th, but recalls that preventing sparks was a consideration later. Joint Exh. 70, at 19-20. Mr. Logan recalls such an order but cannot recall whether it was given on the 28th. Joint Exh. 136, at 47. Shift foreman Adam Miller, when asked if he recalled whether there was a concern about sparking on the 28th replied: "No, not on the 28th." Joint Exh. 137, at 13. Mr. Frederick seems unable to recall anything about such an order on any date. Joint Exh.

132, at 8. Nor does Mr. Illjes. Joint Exh. 127, at 10-11.¹⁶ Nor does Mr. Conaway. Joint Exh. 136, at 47.

Conclusions on Mr. Mehler's Testimony

147. Even though Mr. Mehler realized rather promptly that the pressure spike on March 28 was a real pressure increase, he has never wavered in his belief that there was no appreciation or discussion of hydrogen or hydrogen explosion on that date. The only thing remarkable about Mr. Mehler's testimony is the firmness of his initial belief that the instruction not to operate electrical equipment came on March 28 just prior to operating the reactor coolant pumps that evening.

148. It is not clear that Mr. Mehler "retracted" his earlier statement to that effect as Licensee suggests. Licensee Reply Finding 8. A better interpretation is that he deferred to what he regarded as better evidence that the order came on the 29th and that Mr. Mehler recognized that his earlier statements were probably wrong. Mr. Mehler's revised opinion was not a simple change of mind, he came to the conclusion that the order was probably given on the 29th only after a thoughtful approach to the matter — studying the log, talking to his colleagues and thinking it over. He does not claim that his memory was refreshed by those steps, a restraint that enhanced his credibility.

149. In any event, we cannot accept TMIA's argument (not without its logic) that Mr. Mehler's earlier statements, closer to the events, should be accepted over his later statements. Mr. Mehler himself lost confidence in the earlier statements. Given the large amount of reliable evidence that the order not to operate electrical equipment came after March 28, and no reliable evidence that it came on the 28th, we accept Mr. Mehler's revised opinion. The order was not issued on March 28. It was issued first on March 29.

150. Mr. Mehler's interview with Mr. O'Connor of Metropolitan Edison took place on April 25, 1979 — before the mailgram. Joint Exh. 17. It reflects Mr. Mehler's awareness then that the spike was real — a point not in dispute. *Id.* Other than the pressure spike itself and the reference to the actuation of the containment sprays, the April 25 interview provided no information that would have alerted Mr. Dieckamp to any possibility that anyone appreciated a hydrogen detonation on March 28. In fact, Mr. Mehler's April 25 interview and others conducted before May 9, 1979, are interesting in that the pressure spike seems to

¹⁶ But Mr. Illjes stated on May 23, 1979, that there had been a discussion of the arcing potential of the EMOV which could ignite hydrogen, but he could not say that it was discussed on March 28. Joint Exh. 36, at 9-10.

have a rather low priority in the discussions. Even weeks after the accident the importance of the spike was not apparent in the interviews.

D. Theodore Illjes

151. Mr. Theodore Illjes was a control room operator working the three-to-eleven shift under Mr. Chwastyk on March 28. By the time he was briefed and made other preparations it was not until about 6:30 p.m. that he began working at the console. Joint Exh. 36, at 2-5. Mr. Illjes was interviewed twice before the hearing. In the first interview, by the NRC on May 23, 1979, Mr. Illjes stated that, upon initial briefing, he was told that there had been a spike and containment isolation. Later in the evening a "hydrogen explosion" was discussed as a possible cause. *Id.* at 6.

152. Pressed as to when the hydrogen explosion was discussed, Mr. Illjes explained:

If I want to relate it, I would say it was after we drew the bubble in the pressurizer which we did after that. As far as what time that was mentioned, as far as we discussed it, *I know it was discussed when we turned over* [shift change], when we came in, but we didn't make any bones about it because we were interested in getting flow through the reactor and the bubble in the pressurizer and so. They had recovered from the building isolation high pressure injection. They had recovered from that situation, and our concern was cooling the reactor and insuring it had flow. Later on when we had things stabilized, we had a bubble in the pressurizer and had a reactor coolant pump running and that term area, we were discussing with, I can't remember if it was one of our engineers. *But we did have a pressure spike.* We pulled it out and I don't know who wanted a copy but we made a couple copies of the chart.

Id. at 7 (emphasis added).

153. Mr. Illjes had recalled clearly that when the shift "was turned over" he learned only that there had been a pressure spike and the unit had recovered from containment isolation, with no mention of hydrogen at that time. *Id.* at 6, 8-9. Therefore, we posit from the passage just cited that Mr. Illjes on May 23 had begun retrospectively to refer to the pressure spike as the hydrogen explosion, and *vice versa*, as we have noted in accounts by other commenters.

154. The NRC interviewer may also have fallen into the same pattern as the following exchange indicates:

FASANO: So a pressure spike was discussed at the turn over, when you first came in, about 3:45. And then somewhere about 8:00 further discussion and also xerox copies [of the containment pressure strip-chart recorder]?

ILLJES: Right.

FASANO: And apparently . . .

ILLJES: I think we remembered the xerox machine wasn't working too good.

FASANO: At this time you discussed what and with whom, if you can remember?

ILLJES: We talked, I talked about it with the trainee on our shift, who was Chuck Mell. And the person that asked for the information, and I don't remember who that was, whether it was an NRC inspector or a B&W representative.

FASANO: Was any discussion related to this? Was the hydrogen burn or was a real spike or was this discussed as an electrical spurious signal possibly?

ILLJES: This was discussed that evening but we also talked about it several times after that and I cannot separate the two different discussions but as far as I remember we related it to a cycling of the electromatic relief isolation, which is a DC operated valve I believe and that has a contact in there which will cause arcing which possibly could ignite the hydrogen. That was discussed, but I can't say we discussed it that night. We didn't really have that much time to do a lot of discussion, but we talked about it and when I walked away from the panel, the guy that wanted the copy, you know, he wanted it now, and I had to walk away from the panel to make sure that the other guy, my shift supervisor, was there while I walked away so . . .

FASANO: On the first evening, can you recall if on that first evening you were discussing after 8.00 that it was possibly a hydrogen burn?

ILLJES: As far as I know that possibility was discussed that evening.

Id. at 9-10.

155. From the foregoing one could, and perhaps should, conclude that as of May 23, 1979, Mr. Illjes' best memory was that a hydrogen explosion was discussed as the cause of the pressure spike the evening of March 28. But as the interview continued, Mr. Illjes introduced a new factor into his memory of the events:

ILLJES: It was also that night, you know, that we determined *that we had a hard bubble and what that bubble was*, you know, we had talked about that too, you know . . . What is the gas and is it hydrogen or other and all that water that went through the reactor and out into the RC drain tank and out into the reactor building.

Id. at 10 (emphasis added).

156. The "hard bubble" comment was not pursued on May 23. The question would arise again as to whether the "hard bubble" to which Mr. Illjes refers was related to a real pressure spike on March 28 or to the widely publicized concern of some days later that there was a hydrogen bubble trapped in the head of the reactor vessel.

157. Mr. Illjes was interviewed again on September 24, 1980, by the special IE team investigating the information-transfer matter. Joint Exh. 127. The team was very interested in Mr. Illjes' earlier statements about hydrogen:

Q Is it still your recollection that hydrogen was discussed on March 28th, 1979, as a possible cause of the pressure spike?

A To my recollection, we discussed the pressure spike.

Q Do you recall who you discussed it with?

A The other two men in the control room at the time, and Joe Chwastyk was sitting behind us, or in the near vicinity. I don't remember if he was in the conversation or not. But the other two men on the shift —

Q That would be Mell and Kidwell?

A Yes.

BY MR. HOEFLING:

Q Was hydrogen a part of those discussions, do you recall?

A I don't remember.

Q When you said "pressure spike," you used that intentionally? You were talking about the pressure spike?

A Yes.

Q And not necessarily hydrogen?

A It's hard for me to separate all the discussion that was made on that night. I can't really say, because it was discussed how many times thereafter, and that far apart I can't relate the difference.

Id. at 6-7.

158. This passage suggests again that Mr. Illjes had begun retrospectively and generically equating hydrogen with pressure spike.

159. The IE team also attempted to resolve with Mr. Illjes his memory on May 23, 1979, that there had been a "hard bubble" determined on March 28:

Q ... The other investigations to date have concluded that it was not until subsequent to March 28th, 1979 — either late Thursday evening or early Friday morning sometime — that a realization took place that a hydrogen bubble existed in the primary system in the reactor vessel head, this noncondensable bubble.

You have previously testified that the reason you recall that you knew of the spike on March 28th, the evening of March 28th, was that that same evening

you became aware that there was a hard bubble of hydrogen — using your words there — which was in the reactor vessel head.

The discrepancy which I'm trying to resolve is the contradiction in when you knew of the hydrogen bubble and when the other investigations have concluded that there became general knowledge of the fact that a hydrogen bubble, or noncondensable gases still existed in that reactor system.

Can you explain the discrepancy between that?

A No.

Q Is it still your recollection that you were aware of a bubble of hydrogen, or noncondensable gases, which remained in the reactor vessel head on March 28th, 1979?

A I can remember the bubble and the problem that we had which we were trying to resolve at the time. I can remember the bubble being in the "noncondensable bubble," so to put it. I do remember that.

Joint Exh. 127, at 8-9.

160. When pressed on the point he remained of the opinion that the "hard bubble" was identified on the 28th because he associated it with trying to establish a bubble in the pressurizer. *Id.* at 9. Mr. Illjes also consistently remembered in both interviews that the pressure spike had been xeroxed on the 28th, a point we return to later. Joint Exh. 36, at 7-8; Joint Exh. 127, at 5-6.

161. At the hearing Mr. Illjes had almost no recollection of conversations on the day of the accident. To the best of his recollection, he does not remember a discussion of hydrogen on the evening of the 28th. Tr. 29,595 (Illjes). He could not recall discussing the pressure spike with Messrs. Chwastyk, Mell and Kidwell that evening. Tr. 29,597 (Illjes). He does not recall any discussion correlating the spike with the operation of the relief valve. Tr. 29,600 (Illjes). He could not recall any discussion about hydrogen in the reactor vessel. Tr. 29,610 (Illjes). He had no recollection of being told by Mr. Chwastyk that the pressure spike was real, that it represented an explosion, that the explosion was due to hydrogen, or that the source of the hydrogen was a zirconium/water reaction in the reactor core. Tr. 29,652-53 (Illjes). He didn't seem to recall his previous interviews. He simply acknowledged that the transcripts say what they say. *E.g.*, Tr. 29,607 (Illjes).

162. Mr. Illjes tried to be helpful by his analyses of the log and knowledge of procedures. On that basis, Mr. Illjes believes now that the realization that a hydrogen burn had actually occurred was later, probably Friday, March 30. He believes that if the pressure spike had been attributed to a hydrogen burn or hydrogen explosion on Wednesday,

March 28, there would have been corrective measures taken and perhaps a log entry made. Tr. 29,650-51, 29,745 (Illjes).

163. Mr. Illjes also testified that he remembers Steve Pogi as one of the engineers who was present when the spike was attributed to hydrogen. Mr. Illjes recalls that Mr. Pogi was not present on the day of the accident. Tr. 29,657-59 (Illjes). Mr. Pogi was a Penelec Former GPUSC startup engineer who arrived at TMI on Friday, March 30, 1979. TMIA Exh. 11, at 2.

164. The Board has no reason to believe that Mr. Illjes' loss of memory was simply a convenience. He was no more helpful with his memory to counsel for Licensee than he was when cross-examined by Intervenor. *E.g.*, Tr. 29,642 (Illjes, Blake). We conclude that Mr. Illjes simply does not have a good memory. By the time of his first interview, May 23, 1979, he had already begun to show signs that his memory was influenced and confused by after-acquired information. His recollection of a "hard bubble" of hydrogen in the head of the reactor vessel on March 28 is a very good example of this. Today he acknowledges that, during his earlier interviews, he had difficulty keeping his days straight. Tr. 29,637 (Illjes).

165. In sum, and without disparagement to Mr. Illjes, we conclude that the better course is to give little weight to Mr. Illjes' testimony from memory at the hearing or in earlier interviews. His analyses of the log and procedures, however, are credible. In any event, Mr. Illjes' first interview, on May 23, occurred well after the May 9 mailgram.

E. Gary P. Miller

166. On March 28, 1979, Mr. Gary P. Miller was the TMI station manager in charge of both units through their respective superintendents. He arrived at the station at about 7:00 a.m. on March 28 and, because of radiation indications, he soon became aware of the need to initiate the emergency plan. Mr. Miller served as emergency director. He assembled his senior and most qualified people into what was later labeled the "think tank." He placed Mr. Michael Ross, operations superintendent of TMI-1, in charge of operations (Mr. James Floyd, operations superintendent of TMI-2 was away on a training assignment). Mr. George Kunder, TMI-2 Technical Support Superintendent, was placed in charge of engineers. As we have noted throughout, SRO shift supervisors Chwastyk, Mehler, and Zewe, and perhaps other shift supervisors, were also present during much of the day and at the time of the pressure spike.

167. Mr. Miller testified from a mixture of his own memory and his understanding of events from transcripts of his previous statements. He testified that, on March 28, he heard a "thud" which was subsequently correlated to the time of the spike; that he asked others in the control room what the sound was; and that he was told something to the effect that it was the ventilation damper.¹⁷ Tr. 30,186-87 (Miller).

168. Mr. Miller testified further that today he cannot recall that he was aware on March 28 of either the pressure spike or the actuation of spray pumps. Tr. 30,190, 30,200 (Miller). He seemed to place greater reliance on previous statements to the effect that he was not aware of those events on March 28 than on his present memory. *Id.*

169. On April 14, 1979, Mr. Miller organized a taped, group discussion with key personnel on his own initiative to discuss and record the events of March 28. Mr. Miller prepared a statement from the transcript of that discussion. Joint Exh. 10.

170. Subsequently Mr. Miller was interviewed or deposed seven times, by our count, ending with the September 5, 1980 interview by the IE team investigating information flow. The Board has reviewed each passage cited to us by the parties (and two identified by the Board) relevant to whether on March 28th Mr. Miller was aware of the pressure spike and the containment spray actuation.¹⁸

171. On the whole his statements support his present testimony that he cannot recall being aware on March 28 of the pressure spike and the actuation of the spray pumps. Each of the statements is consistent with that position, but two of them raise questions about the matter. First, TMIA points to Mr. Miller's report of the group discussion of April 14, 1979, where he stated:

It should be noted that at approximately 1400 I heard a loud deep noise *and at that time the Reactor Building spray pumps started* and subsequent to the events of this day I learned that this was a 30 lb. pressure spike which occurred in the Reactor Building due to hydrogen.

Joint Exh. 10, at 21-22 (emphasis added).

172. Licensee responded by noting that Mr. Miller stated only that he heard a noise, not that he became aware of the spray. Licensee also

¹⁷ The Special Inquiry Group reported on the nature of this sound. It has also been referred to as "a thump," "a bump," "a whoomp" and the "popping" shut of the ventilation damper. The SIG states that the sound was most likely water hammer in the reactor building spray system piping. We are not aware of any other reliable explanation. Joint Exh. 106, at 42; (SIG Report, Vol. I).

¹⁸ Joint Exh. 10, at 21-22 (April 14, 1979); Joint Exh. 23, at 26, 70-71 (May 7, 1979); Joint Exh. 39, at 57-58, 63 (May 31, 1979); Joint Exh. 83, at 31-32 (September 20, 1979); Joint Exh. 85, at 25 (September 28, 1979); Joint Exh. 93, at 28-29 (October 18, 1979); Joint Exh. 95, at 18-22 (October 29, 1979); and Joint Exh. 122, at 26, 111-23 (September 5, 1980).

asserts that Mr. Miller used the pronoun "I" throughout the group report, when in fact the report undertakes to record the knowledge of the entire group. We agree that Mr. Miller misused "I" in the report where he seems to have embodied the entire TMI-2 emergency team into his own person. See Licensee Reply Finding 77, n.46 for examples.¹⁹

173. When questioned on September 5, 1980, about the cited portion of his April 14, 1979 report, Mr. Miller explained that the statement in question was the result of the meeting with his key people. Joint Exh. 122, at 114. At the hearing Mr. Miller testified that he had intended the April taping to record the combined recollections of all the participants for Mr. Miller's own use in the investigations which were then just beginning. Tr. 30,261 (Miller).

174. A similar ambiguity appears in the transcript of Mr. Miller's May 7, 1979 interview with the NRC:

The containment, we felt, was stable. The reasoning there would be that, up till 2 o'clock, and I'm aware we had a hydrogen excursion, *I was aware at 2 o'clock we had an excursion*, but up till that point, we had not seen anything above 4-5 pounds in the building. . . .

Joint Exh. 23, at 26 (emphasis added).

175. Later, on September 5, 1980, when the IE team was specifically concentrating on information flow, Mr. Miller's May 7, 1979 statement was brought up. Joint Exh. 122, at 119. Mr. Miller explained that he had not intended to state on May 7, 1979, that on Wednesday, March 28, he was aware that there had been an excursion. He did not gain that awareness until Thursday or Friday, and the passage in question simply reflected that after-acquired knowledge. *Id.* at 120. In another portion of the same May 7, 1979 interview, Mr. Miller clearly indicated that he did not have knowledge on March 28 that the spike was real. Joint Exh. 23, at 71. The statement in question could easily be the result of a transcribing error or a misstatement by Mr. Miller. When considered in light of the many other statements made by Mr. Miller on the matter, we conclude that it is of no importance.

176. We have already discussed Mr. Chwastyk's communication — or noncommunication — with Mr. Miller about the pressure spike. TMIA states that Mr. Mehler also testified that Mr. Miller was aware of

¹⁹ The Board noticed this tendency at the hearing, too. *E.g.*, Tr. 30,256, lines 18-20 (Miller). We also noticed several occasions when Mr. Miller awkwardly used the third person, "Gary Miller" where one would normally say "I," "me," "we" or "us." *E.g.*, Tr. 30,133, 30,147, 30,152, 30,153, 30,192, 30,195, 30,254, 30,263 (Miller). Mr. Miller does not have the communication skills that might be expected in a person with his background.

the pressure spike on March 28. TMIA Proposed Finding 75, citing Joint Exh. 89, at 29 (Mehler) and Tr. 29,483 (Mehler). However, Mr. Mehler testified only that he assumed that Mr. Miller knew of the spike because he, Mehler, assumed that everyone in the control room knew about it, particularly those who were up at the console. Tr. 29,483 (Mehler). Moreover, Mr. Mehler had no recollection of discussing the pressure spike with Mr. Miller. Joint Exh. 115, at 14 (Mehler).

177. Mr. Marshall also assumed that Mr. Miller would be aware of actuation of the spray pumps from his position in the control room. TMIA Exh. 32G, at 10, 15-16. Mr. Zewe stated that he had found it hard to believe that anyone who was in the control room observing anything would have missed the spike, the turning off of the pumps, or the discussions. Joint Exh. 75, at 260.

178. TMIA also states that NRC Inspector James Higgins "testified that he believed Miller told him that he knew of the pressure spike on March 28." TMIA Proposed Finding 76. However, Inspector Higgins' statement (on June 21, 1979) was not that clear:

And, on Friday, people, I guess, were going over the charts and were looking at that and I started, picked it up and started to discuss it with plant management and came out and talked to Gary Miller about it and at that point he said that, in discussing at that point, he realized that he had heard it and that he had recognized it on Wednesday but that was the first time he had thought of it since then, that he had completely forgotten about it in the whole rush of events that occurred, and he stated at that point he remembered, clearly saying to the operators what was that, and looking over and the operators securing the building spray pumps and it was at that point on Friday that I believe, that plant management really realized that they had that pressure spike.

Joint Exh. 19, at 24-25.

179. In later interviews, Mr. Higgins stated that he believed that Mr. Miller had become aware of the spike either on Friday morning or a couple of hours before then. Joint Exh. 79, at 50-51 (Higgins). In any event, the impression Mr. Higgins gained was that Mr. Miller had heard something on March 28; it had registered momentarily on his mind; but that it was past history seconds later; and that it wasn't until Friday that Mr. Miller, looking back, understood its significance. Joint Exh. 199, at 23-24 (Higgins).

180. TMIA also mounts a circumstantial argument that Mr. Miller had been informed of a complete set of fifty-one incore thermocouple temperature readings taken on March 28 from which Mr. Miller properly interpreted the pressure spike as a hydrogen burn at the time it occurred. TMIA Proposed Finding 81.

181. Incore thermocouples were installed at TMI-2 to support the startup and test program. Although they were neither utilized by plant operating personnel nor relied upon in any procedures, incore thermocouple temperatures could be printed out on the control room alarm computer printout. The computer's range was limited to 700°F. Readings in excess of 700°F were printed out as question marks. Joint Exh. 106, at 898 (SIG Report). Mr. Miller, however, did not understand the significance of question marks on March 28. Tr. 30,133 (Miller).

182. Soon after he began the initial assessment of the plant's status, Mr. Miller directed Mr. Ivan Porter, the lead instrument engineer, to take incore thermocouple readings at a point at or before the computer inputs. Tr. 30,133 (Miller). This tactic was based in part upon Mr. Miller's experience from the Navy and the TMI test program. Tr. 30,138-39 (Miller). Mr. Porter reported back to Mr. Miller after the first set of readings were taken. At the hearing, Mr. Miller's memory of the report was poor. Tr. 30,143 (Miller). In an early interview, May 7, 1979, he stated that:

[T]he other thing is that I had Ivan Porter read out the thermocouples on the incores which are not a device that are extremely accurate, but they are an indicator, it came out question mark on the computer. He sent an instrument tech down, the instrument tech came back and Ivan told me that some read 200 some read 400 and some read 2500 and some didn't read. Then he explained to me that if they were really hot they would melt and form other junctions and that the calibration wouldn't be good anymore. So, you know, the bottom line here was that they're hot, they were hot enough that they scared you, as far as what you're looking for. It told me the reason the computer was off scale at 700 degrees. So I came in at 15 after 7, T_h was pegging high, T_c was pegged low. The in-cores were reading anywhere from 2500 or so, and I picked 2500 it could have been higher than that. But that, you know, I was looking for a gross indicator and I had it. Our goal was to maintain HP injection, maintain steaming, core cooling and attempt to go solid. I know that we were super heated and all that sort of thing. I don't think we tumbled to that kind of [logic] but we just knew we didn't have a control, we were out of control. We knew the situation was one we hadn't anticipated too many times here.

Joint Exh. 23, at 55-56.

183. Despite his poor present memory of the thermocouple results, Mr. Miller seemed positive in his testimony that on March 28 he regarded the results as unreliable. Tr. 30,144-45, 30,151, 30,152 (Miller).

184. Mr. Porter testified that from his knowledge of the condition of the thermocouples since the accident he would not agree that the millivolt readings from the thermocouples (the method used by his technicians) would represent actual temperatures. His particular concern on the 28th was that the temperature readings should have been very close to each other, but that he recalled readings scattered from 200° to

2200°F and that 200°F was unreasonable for that time. Tr. 31,484-86 (Porter).

185. Mr. Miller stated that he did not have the complete set of fifty-one thermocouple readings (with six readings exceeding 2200°F) available to him until a matter of weeks after the accident. Tr. 30,171 (Miller). But TMIA imputes knowledge on March 28 of all fifty-one thermocouple readings to Messrs. Porter and Miller based upon the deposition of Mr. Richard Lentz, a General Public Utility Service Corporation (GPUSC) engineer. TMIA Exh. 32. The Lentz deposition does not support TMIA. In fact, it appears that the opposite is true; the complete sets of readings did not become available until after March 28. *Id.* at 118-22.

186. TMIA also asserts that Mr. George Kunder's prior testimony indicates he knew that Mr. Porter had relayed incore temperature readings greater than 2200°F to Miller on March 28. TMIA Proposed Finding 94. Mr. Kunder testified in this proceeding, however, that he was not aware of incore temperature readings in that range until weeks after the accident. Tr. 30,060 (Kunder). Mr. Kunder testified that his knowledge concerning what information Porter had relayed to Mr. Miller was derived from having heard testimony on this point in hearings before the Kemeny Commission. Joint Exh. 59, at 13 (Kunder); *see also* Tr. 30,065-68 (Kunder). Mr. Kunder recalled that the temperatures data available to Mr. Miller on March 28 were not useful in diagnosing what was going on in the plant. Tr. 30,067 (Kunder).

187. Mr. Ross, deposed by the Special Inquiry Group, stated that the thermocouple readings provided to Mr. Miller, because of their very wide range, were not taken in a "serious vein." Joint Exh. 81, at 23-24; *see also* Joint Exh. 124, at 45-46 (Ross). Mr. Leland Rogers made a similar statement. Joint Exh. 87, at 29-30 (Rogers). TMIA cited a string of some twenty citations to the effect that temperatures greater than 2200°F were known in the "think tank" on March 28 and communicated to Mr. Miller. TMIA Proposed Finding 95. We checked each of the citations and could find none to the effect that readings of temperatures greater than 2200°F were believed to be reliable on March 28.²⁰

188. Finally, TMIA argues that Mr. Miller's earlier statements that he was unaware of the alarms and the engineered safeguards (ES) signal at the time of the spike are not credible. TMIA Proposed Finding 75. Mr. Miller's testimony was that he cannot recall the alarms. Tr. 30,199

²⁰ However it is clear that the instrument technicians actually measuring the incore signals believed at the time that the high readings accurately indicated high temperatures. Mr. Yeager stated "Christ, this thing is melting down!" Both Mr. Yeager and Instrumentman Wright believed that the core was uncovered. TMIA Exh. 32(c) (Yeager).

(Miller). Apparently the ES signal correlated to the pressure spike was the third ES signal of the day (Tr. 30,195 (Miller)), and there had been many alarms throughout the day (Joint Exh. 136, at 53-54). We cannot find either way whether Mr. Miller heard the alarms and was aware of the ES signal at the time of the spike.

Board Conclusions on Mr. Miller

189. Mr. Miller's testimony at the hearing was not very instructive to the Board. We have relied more upon his previous statements, the statements of others, and the circumstances in our effort to determine whether on March 28 Mr. Miller interpreted the pressure spike and containment spray actuation in terms of hydrogen combustion and core damage.

190. The question of whether Mr. Miller, on March 28, knew about the pressure spike and the containment spray actuation is a legitimate one. There are several circumstantial factors indicating that he should have been aware of those events. Others, similarly situated, were aware of the spike. There were alarms and the relatively rare engineered safeguard (ES) signal. There was increased activity among the operators. Mr. Miller heard the noise, which was remarkable enough to prompt him to ask about it. He was actually in the process of gathering data for the impending report to the Lieutenant Governor, thus, presumably, he was sensitive to changes in plant status.

191. On the other hand, we place little significance in the early reports of incore thermocouple readings exceeding 2200°F. These readings were not then believed. In any event, high incore thermocouple readings would not tell Mr. Miller that the pressure spike was real if he did not even know about the pressure spike. Those who knew the spike was real, Mr. Mehler for example, did not dwell on it, and immediately went to other tasks. Mr. Chwastyk was rather certain that Mr. Miller was preoccupied with his preparation for the trip to the State Capitol. His departure for the State Capitol is inconsistent with an appreciation that there had just been a real pressure spike sufficient to actuate the spray pumps.

192. As improbable in retrospect as it might seem that a containment pressure spike of some 30 pounds would not be noticed by Mr. Miller, it is no more improbable — again in retrospect — than the fact that other severe plant conditions were not understood on March 28. Finally, in his early statements on the matter, he has consistently and believably asserted that he did not know about the pressure spike on March 28.

193. The preponderance of the evidence is that Mr. Miller did not know about the spike or spray actuation on March 28. The most we could find from the evidence is the possibility, averred to by NRC Inspector Higgins, that Mr. Miller, on March 28, may have recognized a pressure spike (perhaps the securing of spray pumps); put it out of his mind until the morning of March 30; then recalled it when the hydrogen burn was understood. In any event, there is no reliable evidence that on March 28, 1979, Mr. Miller interpreted the pressure spike and containment spray actuation in terms of hydrogen combustion and core damage.

F. John G. Herbein

194. Mr. John G. Herbein was Vice President of Generation, Metropolitan Edison Company, at the time of the accident. He arrived at the observation center (also known as the "Visitors' Center") near Three Mile Island at about 11:45 a.m. on March 28 and remained at the observation center. He was in radio contact with the TMI-2 control room throughout the day. His primary contact was with his subordinate, Gary Miller. Mr. Herbein testified that he was not aware on March 28 of incore thermocouple temperature readings in the range of 2400°F. Tr. 30,299-301 (Herbein). Nor was he aware on March 28 of a pressure spike, having become aware of it through Mr. Lowe on the 30th or 31st of March. Tr. 30,418 (Herbein).

195. TMIA alleges that Mr. Herbein's testimony is incredible because Mr. Miller passed such information on to Mr. Herbein. TMIA Proposed Findings 96, 100, 101. Since we find that Mr. Miller did not know about the pressure spike and hydrogen burn on March 28, we cannot, of course, find that he passed this information on to Mr. Herbein. However, as we noted above, Mr. Miller and others had the early thermocouple readings and they could have passed this information to Mr. Herbein. TMIA Proposed Findings 96-98.

196. Mr. Herbein testified before the Kemeny Commission on July 29, 1979, that the high incore temperature readings were relayed to him on March 28, but because of the question marks, zero readings and some readings as high as 2400°F, the readings looked as though they were "woefully inaccurate." Joint Exh. 61, at 15 (Herbein). At the hearing, however, Mr. Herbein testified that he had not intended to tell the Kemeny Commission that on March 28 he had information to the effect that incore readings were as high as 2400°F. Tr. 30,304 (Herbein). He stated that he has been asked that question "again and again" but nowhere did he indicate that he had that knowledge on March 28. *Id.* Contrary to his testimony, however, the Board can identify only one other

statement by Mr. Herbein on the incore temperature readings — his deposition to the Special Inquiry Group on September 19, 1979. Joint Exh. 82, at 17-18 (Herbein). There his testimony was much the same as to the Kemeny Commission. He thought that he had had a conversation with the control room on March 28 about Mr. Miller seeing a few incore thermocouple readings — some question marks, some zeros, some high, and some very low. The range of data and missing points indicated to Mr. Herbein that the data were basically unreliable and inconclusive. *Id.*

197. The Board concludes that Mr. Herbein's testimony that he did not know about the early high incore temperature readings is, as alleged by TMIA, not credible, in light of his two earlier statements. While we do not understand how Mr. Herbein could have been so positive about the matter in his testimony (Tr. 30,304-05), the matter is not important and does not reflect upon his candor. His earlier statements were about the same as every other informed person, i.e., the scatter of thermocouple readings was illogical and the readings were thought to be unreliable.

198. The preponderance of the evidence establishes that Mr. Herbein did not know about the pressure spike on March 28, much less that he correlated it with hydrogen burn and core damage. He possessed about the same information as did Gary Miller about the early incore thermocouple readings.

G. Knowledge of Other Individuals

199. Virtually every individual in a position to have relatively direct knowledge of the pressure spike and containment spray actuation has been interviewed, some many times, since the accident. As far as we can determine, statements from each of them have been received into evidence. There has been almost an open-ended opportunity for the parties in this proceeding to discover and to present such information.

200. Mr. Hugh McGovern, a control room operator, dictated a chronology of events to Mr. Marshall, operations engineer, at about 3:00 p.m. on March 28th. As relevant, he noted:

1400 Had a [loss] of 2-32A and 2-42A[,] loss of radiation area monitors and an RX building pressure spike that went off scale on narrow range meter — definite spike straight up, straight back down ... had full Rx building (spray pumps and [BS-V1's], DH-V8's) isolation and cooling. Someone secured spray pumps, shut BS-V1's and DH-V8's (Hugh did) and unisolated equipment for building.

Joint Exh. 1, at 2, 5. Licensee correctly notes that this statement indicates only an awareness that the spike had occurred; it attributes no significance to the spike.

201. In a May 4, 1979 Met Ed interview, Mr. McGovern explained the appreciation that he and others had of the significance of the spike:

[I]t was exactly when we had the reactor building pressure spike. At the time I don't think anybody thought it was an explosion. We thought that we just lost a bus. ... At the time we thought the spike on the recorder was an electrical spike and not an actual pressure spike.

Joint Exh. 21, at 7-8.

202. The best inference to be drawn from Mr. McGovern's statements is that he regarded the spike at the time of its occurrence to be a signal anomaly.²¹

203. Mr. Craig Faust, a control room operator, stated in an April 6, 1979 interview with Met Ed:

Q What about the reactor containment building spike?

A We probably had some sort of explosion because that's what it looked like; shock waves.

Q Did you hear anything?

A No I didn't.

* * *

Q The spray pumps came on automatically?

A Right.

Joint Exh. 8, at 5-6.

204. Licensee argued that Mr. Faust's statement that they probably had "some sort of explosion" should be read as a retrospective observation, and that it provides no basis for a belief that Mr. Faust understood the spike to represent hydrogen generation or zirconium/water reaction. This reading is probably correct because, in an NRC interview of Mr. Faust on April 21, 1979, he stated:

²¹ Licensee offered into evidence portions of a TMIA deposition of Mr. McGovern tending to corroborate the statement that the spike was regarded as electrical, but the Board Chairman vaguely "accepted" the deposition as compared to receiving it into evidence. Tr. 29,542. TMIA now objects to Licensee's citation to the deposition on that basis. We see no need to enter that fray. The problem with both the deposition and the May 4, 1979 statement is that neither indicates when Mr. McGovern later became aware that the spike was real.

The only other thing we had was this spike in the building, which I believe we are now interpreting *possibly* to a hydrogen explosion.

Joint Exh. 12, at 82-83 (emphasis added).

205. The best inference to be drawn from Mr. Faust's statements is that on March 28 he understood that there was an actual pressure spike and containment spray actuation but that he did not then understand the significance of those events. See Joint Exh. 2, at 11 (Faust); *but see* Joint Exh. 28, at 145; Joint Exh. 133, at 7 (Faust alludes to instrumentation problem).

206. On April 21, 1979, Mr. Donald Berry, an engineer who was maintaining a log of events in the control room at the time of the pressure spike, was interviewed by the NRC:

A People didn't really, I don't think, understand at that point [spike] what happened. I didn't understand at that point what happened. Sprays came on. We know that and then they, as I logged there, they turned the sprays off, you know, the pressure had spiked up and came back down.

Q Why did they stop the sprays?

A The pressure was back down to normal or close to normal level and they turned the spray off. So at that point I don't think we really realized and it wasn't until we were reading about the spike in the paper that there was a possible hydrogen, and I am going back things through my mind, when it could happen. I was there from 7:00 in the morning until 6 o'clock the next morning and then it dawned on me that we had the building spike. And that was the only way I could see that people must have later realized and that is what they tied it to.

Joint Exh. 13, at 17-18 (emphasis added).

207. Mr. John Flint, a B&W employee who was in the control room throughout the 28th, in an April 23, 1979 NRC interview, stated:

In this range of time, heard a double thump, and at the time we had been in and out of respirators. I assumed that the sound I heard was just a ventilation cycling at this time. There appears to be a correlation with this and the reported hydrogen detonation in the building at that time.

Joint Exh. 14, at 6 (emphasis added).

208. In an April 23, 1979 NRC interview, Shift Supervisor William Zewe stated:

I was right on the recorders themselves and they just went (whistle) up and right down. And I said, "What the heck was that." . . . And he said, "Bill, we've started the buildings spray pumps." And I said, "What?" And so I looked over, and they were running and I pondered that for about 30 seconds. I guess, because I thought,

there just must have been some electrical fault surge from the electromatic, that caused the building spray pumps to come on.

Joint Exh. 15, at 33. Mr. Zewe left no doubt as to his understanding of the pressure spike indications:

I was convinced at that time it was just a false electrical signal.

* * *

It never entered my mind that it was a hydrogen explosion, at that time at all.

Id. at 38. He stated that he discussed the spike with Joseph Chwastyk and Michael Ross, and they also concluded it was some sort of electrical transient. Joint Exh. 75, at 256-59. *See also* Joint Exh. 119, at 42-44.

209. In a May 9, 1979 NRC interview, Mr. Joseph Logan, the TMI-2 Superintendent, stated that although he was in the control room at the time, he did not recall a report that reactor building sprays had activated. He did hear a noise, asked what it was, and someone reported it was the ventilation system. Joint Exh. 25, at 72-73; Joint Exh. 77, at 14-15. Mr. Ivan Porter, lead instrumentation engineer, stated he was not aware of the pressure spike on March 28, 1979. Joint Exh. 70, at 12-14. Mr. George Kunder, in charge of technical assistance, testified in this proceeding and has previously stated that he was not aware of the pressure spike on the 28th. Mr. Kunder, who also went to the State Capitol with Mr. Miller, was collecting data for that purpose at the time of the spike. Tr. 29,994 (Kunder); Joint Exh. 72, at 25-27.

210. Mr. Leland Rogers, B&W's site operations manager, stated that he was not aware of the pressure spike. He did hear a "bang" but was told it was ventilation dampers. Joint Exh. 87, at 47-48; Joint Exh. 100, at 49-50.

211. Two NRC inspectors who were in the control room — James Higgins and Donald Neely — were not aware of the pressure spike on the 28th. Joint Exh. 79, at 51 (Higgins); Joint Exh. 129, at 22-24 (Higgins); Joint Exh. 90, at 16-17 (Neely); Joint Exh. 130, at 8-9 (Neely).

212. Control room operators Edward Frederick and Lynn Wright were aware of the pressure spike, but did not understand it. They attributed it to an electrical or instrument problem. Joint Exh. 28, at 143-47 (Frederick); Joint Exh. 71, at 11-13 (Frederick); Joint Exh. 75, at 264-65 (Frederick); Joint Exh. 111, at 3-7; Joint Exh. 116, at 7-13 (Wright).

213. Mr. Adam Miller, a shift foreman in the control room, was also aware of the pressure spike but did not understand it. He believed it was due to a sudden escape of steam when the EMOV was opened. Joint Exh. 137, at 4-5.

214. Mr. Walter Marshall, an operations engineer in the control room at the time of the spike, was aware of the spike. He stated that they could not come up with any reason for the pressure spike other than an electrical system or instrument fault. Joint Exh. 31, at 23.

215. Mr. Michael Ross, the TMI-1 Supervisor of Operations who was in the Unit 2 control room providing assistance, and near the console at the time, was also aware of the pressure spike, but he attributed it to an instrument problem. Joint Exh. 33, at 3-5; Joint Exh. 81, at 42-44; Joint Exh. 124, at 47-48.

H. Questionnaire Responses

216. In order to respond to many of TMIA's first set of interrogatories, Licensee prepared a thirteen-page questionnaire which was distributed to 456 individuals. Those receiving the questionnaire were present and past GPU System and B&W employees who might be in a position to have information about the pressure spike, spray actuation, the noise heard coincident with the spike, and any realization of hydrogen combustion and core damage inferred from the pressure spike. TMIA Exh. 32(a), at 1.

217. Question 3(a) of the questionnaire asked:

On Wednesday, March 28, 1979, were you aware or informed that a hydrogen explosion or combustion had occurred in the TMI-2 containment building?

Twenty-one individuals answered "yes" to question 3(a). Affirmative answers to question 3(a) would, if correct, be contrary to Licensee's avowed understanding of the facts. Therefore, Licensee contacted all twenty-one persons who responded "yes." In all but one instance (one person, an ex-employee, could not be reached), Licensee discussed with each person his or her response to question 3(a). Licensee's discussion with each person amounted to asking each person whether he or she understood question 3(a). Each of the twenty reported that his or her response to question 3(a) was in error; that in fact each had no information about hydrogen on March 28, or that each could not recall when each first learned about hydrogen. Several were quite specific as to the time and circumstances of their learning about hydrogen on another date. As a result, Licensee prepared and sent a letter to each individual confirming Licensee's understanding of the conversation. Subsequently Licensee sought acknowledgment of its letter from each person contacted (except one who is not currently an employee of the GPU System Companies). TMIA Exh. 32(a), Attach. 3.

218. The Board authorized TMIA to depose and to call as witnesses any six of the twenty respondents. TMIA called Thomas Mulleavy, Joseph DeMan, Curtis Conrad, David Zeiter, A.P. Rochino, and Robert Boyer. Counsel for TMIA cross-examined all six extensively concerning their responses and their discussions with Licensee's attorneys. As might be expected, as a group, the six witnesses called by TMIA had the weakest and most questionable comments on Licensee's followup. *Id.* Each of the six, however, explained in his testimony that his original response to the questionnaire was as the result of misunderstanding. As perceived by the Board, there was plain carelessness in reading. Tr. 31,334 (Mulleavy); Tr. 31,357 (DeMan); Tr. 31,387 (Conrad); Tr. 31,403-04 (Zeiter); Tr. 31,430, 31,432-33 (Rochino); and Tr. 31,558 (Boyer).

219. Messrs. Mulleavy (Tr. 31,334), DeMan (Tr. 31,350-51), and Rochino (Tr. 31,427, 31,434-36, 31,449) testified that it was after the 28th that they learned about the hydrogen burn. Mr. Boyer could not recall when he learned about it. Tr. 31,556-58 (Boyer). Mr. Conrad learned about the hydrogen combustion in the containment building at the hearing during cross-examination, apparently believing that the combustion under discussion was one he thought to be in the reactor vessel itself. Tr. 31,378-80 (Conrad).

220. Similarly, Mr. Zeiter thought that the hydrogen bubble in the reactor vessel, a matter of concern several days after the accident, was the same phenomenon as the pressure spike on March 28 until a couple of weeks before his testimony in this proceeding. Tr. 31,402 (Zeiter).

221. TMIA meets this testimony quite simply: The Board should accept the initial responses to the questionnaire as accurate and regard the testimony of each of them in this proceeding as noncredible. TMIA Proposed Finding 133. We are urged to find that the quality of the testimony by TMIA's six witnesses is so poor that we must "find they were pressured by company attorneys to change their testimony for purposes of these hearings." TMIA Proposed Finding 134. In essence, counsel for TMIA charges the six witnesses with perjury and the company attorneys with subornation of perjury. *See also* TMIA Proposed Findings 103, 111, 116, 120, 127, and 129. The charge is disruptive, unfounded, and professionally reckless. TMIA's analysis of the record based upon its perjury/subornation-of-perjury theory is frivolous and we decline to evaluate it. The Board itself, however, is satisfied that none of the six witnesses knew on March 28, 1979, that there was a hydrogen combustion in the containment. Their testimony to that effect is representative of the twenty-one witnesses who originally answered "yes" to question 3(a).

I. Knowledge of GPU Service Corporation (GPUSC) Engineers

222. On the day of the TMI-2 accident (March 28, 1979), Mr. Richard Wilson, Director of Technical Functions, GPUSC, informed Mr. Robert Keaten (GPUSC) of the event and directed Mr. Keaten to arrange to send some of the GPUSC engineers to the Three Mile Island facility for an investigation of what had happened.²² TMIA would have the Board find that these engineers interpreted the pressure spike in terms of the generation of substantial amounts of hydrogen and serious core damage from information they learned on March 28 or early on March 29, thus, we presume, undercutting the credibility of the Dieckamp mailgram. TMIA Proposed Findings 137-166.

223. TMIA states that Mr. Gary Broughton, who was GPUSC's Control and Safety Analysis Manager, was given the responsibility to obtain data to put together a sequence of events and to address the question of whether the core was uncovered. TMIA Proposed Findings 138-139. Mr. Broughton testified, however, that he did not know whether the question "was the core covered" was a specific assignment. Rather, he suggested that it was the type of question that they would have been able to answer after the data were collected and subsequently analyzed. Tr. 31,708 (Broughton).

224. While TMIA points to Mr. Broughton's testimony that "they might collect strip chart recordings to evaluate the transient" (TMIA Proposed Finding 139), that statement alone creates a false impression of the materiality of strip charts to GPUSC engineers. Mr. Broughton testified: "Generally when we looked at a transient like this we didn't rely on strip charts. . . . In some cases we had to fall back on the strip charts because that information wasn't available through some other source." Tr. 31,081 (Broughton).

225. TMIA attributes generally to the GPUSC engineers knowledge of incore thermocouple temperatures greater than 2500°F. TMIA Proposed Finding 137. Notes taken by the first GPUSC engineer to arrive at TMI — James Moore — indicate that Mr. Moore was told at approximately 5 p.m. on March 28 by Richard Bensele about incore thermocouple readings greater than 2500°F. TMIA Exh. 32K, deposition Exh. 2, at 6. TMIA continues, however, claiming that "Mr. Moore stated that

²² At our hearing, Mr. Keaten could only remember specifically having arranged for Messrs. Gary Broughton and Richard Lentz to go, but said there may have been others. Tr. 31,237-39 (Keaten). Licensee lists the following GPUSC engineering personnel who went to Three Mile Island on March 28: Messrs. Julien Abramovici, Gary Broughton, George Lehmann, Richard Lentz, and James Moore. Licensee Proposed Findings, Appendix C.

after being briefed about temperatures greater than 2500°F he understood that there had been some core damage." TMIA Proposed Finding 142, *citing* TMIA Exh. 32K, at 126. However, the citation indicates that Mr. Moore concluded that there was core damage based on a 1000-R/hr dome reading — information also provided to Mr. Moore by Mr. Bensele at 5 p.m. Mr. Moore's statement only indicates he reached a conclusion regarding core damage after the 5 p.m. briefing, and does not indicate that he based his conclusion on high incore thermocouple readings as TMIA suggests. Mr. Moore, in fact, testified that he did not know that core temperatures in excess of 2200°F would indicate that a zirconium-water reaction would occur or that hydrogen would be produced. TMIA Exh. 32K, at 87-88 (Moore).

226. TMIA asserts that Mr. Moore has stated that he subsequently informed Mr. Broughton of all relevant information including the incore thermocouple temperature readings greater than 2500°F. TMIA Proposed Findings 143. Not one of TMIA's citations, however, supports this claim. Mr. Broughton, as early as in a June 11, 1979 NRC IE interview, stated that he did not have any knowledge of incore thermocouple readings on the 28th. The only affirmative piece of evidence before the Board — Mr. Broughton's IE interview — indicates that Mr. Broughton was not informed of incore thermocouple temperatures. Joint Exh. 48, at 29 (Broughton). The Board also rejects TMIA's claim that "GPUSC engineers were also aware that a significant amount of hydrogen had been produced by a zirconium-steam reaction." TMIA Proposed Finding 146. TMIA cites no evidence to support this.

227. TMIA attributes to the GPUSC engineers knowledge of the pressure spike. TMIA first refers to a briefing of the engineers by George Kunder at about 6 p.m., but TMIA does not claim that any mention was made of the pressure spike. TMIA Proposed Finding 147.

228. TMIA claims that Mr. Lentz photocopied the strip chart on the evening of March 28. TMIA Proposed Finding 152. TMIA ignores Mr. Lentz's present testimony and prior statement to the effect that he did not obtain a photocopy of the pressure spike on that day. Lentz, ff. Tr. 32,972, at 2. Mr. Lentz previously stated in an NRC interview on June 1, 1979, that he photocopied no analog output on March 28. Joint Exh. 47, at 9 (Lentz). TMIA claims that Mr. Lentz "was responsible for preserving analog data, including strip charts on March 28." TMIA Proposed Finding 161. But Lentz testified that this responsibility was not assigned to him until a day or two after the accident. Tr. 32,997 (Lentz).

229. TMIA cites no evidence indicating that Mr. Lentz photocopied the strip chart. Instead, TMIA refers to Theodore Illjes' NRC IE interview (TMIA Proposed Finding 152), in which Mr. Illjes stated that on

March 28 someone (whom Illjes could not remember) asked for a copy of the strip chart. See Joint Exh. 36, at 9 (Illjes). Mr. Illjes stated that he could not remember if the person was an NRC inspector or a B&W representative. *Id.* Even if the Board were to accept Illjes' statement in his IE interview, the Board could not accept TMIA's assertion that "it must have been Lentz who made the photocopy." TMIA Proposed Findings 153.

230. Mr. Illjes' NRC IE interview cannot, however, be accepted at face value — particularly with regard to whether the strip chart was photocopied on the 28th. We have previously noted that Mr. Illjes' memory has been consistently very poor. § IV.D, *supra*. Mr. Illjes' statement has been widely discredited. The possibility that the strip chart was photocopied on March 28 was examined and rejected in NUREG-0600 and in the SIG Report. Mr. Illjes now believes that the discussion of hydrogen, which he remembered in conjunction with the chart being photocopied, occurred on Friday, March 30. Tr. 29,595, 29,651 (Illjes). In addition, other testimony and physical evidence strongly indicates that the pressure chart was not removed on the 28th. Joint Exh. 60, at 9-12; Joint Exh. 107, at 61; Tr. 29,407-09 (Chwastyk).

231. TMIA's last point is that Mr. Keaten's notes "confirm this hypothesis" that GPUSC engineers understood the pressure spike. TMIA Proposed Finding 166. This point rests on the premise that Mr. Keaten's notes were written on March 29. We have found elsewhere, however, that they were written on March 30. § III.A.4, *supra*.

232. There may be some evidentiary ambiguity as to who copied the pressure spike portion of the reactor building pressure recorder strip chart and when the copies were made. We have not attempted to resolve this previously, pending a determination as to its relevancy to the state of knowledge of the GPUSC engineers. The Board concludes that the question of who and when is in no way a pivotal or relevant issue with respect to the depth of understanding about the TMI-2 accident acquired by the GPUSC engineers on the 28th or 29th of March.

233. The Board finds that the GPUSC engineers first sent to TMI on March 28 did not gain an awareness of the significance of the pressure spike on the 28th or early on the 29th of March 1979.

V. WHETHER, IN THE NRC STAFF'S VIEW, MR. DIECKAMP BELIEVED THE STATEMENTS IN THE MAILGRAM WERE TRUE

234. The Licensing Board originally disposed of its concern about the Dieckamp mailgram based upon the report of the NRC Staff's in-

vestigation into information flow, NUREG-0760,²³ and the testimony of the lead Staff investigator, Mr. Norman C. Moseley. In its remand opinion, the Appeal Board explained that our reliance upon NUREG-0760 and Mr. Moseley's testimony was misplaced. We erred primarily because that report was too summary; because our questioning of Mr. Moseley on the point was insufficiently penetrating; because there was then no firm record evidence that Mr. Dieckamp was ever interviewed on the matter; and because we should have examined Mr. Dieckamp on our own. ALAB-772, 19 NRC at 1266-67.

235. Whether NUREG-0760 is an adequate report of the IE investigation, whether Mr. Moseley's views on the Dieckamp matter are sound and, in fact, whether the investigation was complete have, to a large extent, become moot. With the aid of the parties, we have explored the issues as carefully as we know how and have not relied upon the conclusions of NUREG-0760 or those of Mr. Moseley in his early testimony.

236. The Board has not used NUREG-0760 for disputed factual findings. We have purposely avoided referring to the report except to determine whether we have left unexplored avenues of inquiry suggesting that the mailgram was false.

237. When Mr. Moseley previously appeared before the Board on February 18, 1981, he testified that, based upon his September 12, 1980 interview with Mr. Dieckamp, Mr. Moseley believed that Mr. Dieckamp's intent in sending the mailgram was to tell the truth, and that in fact Mr. Dieckamp believed the mailgram was true. Tr. 13,063-64 (Moseley).

238. Even though we do not depend upon Mr. Moseley's conclusions as to whether Mr. Dieckamp believed his mailgram was accurate, it was appropriate and useful, in a negative sense, to hear from Mr. Moseley in the remanded proceeding. That is, in view of the Appeal Board's concern, our duty was to determine whether Mr. Moseley and the IE investigating team possessed information tending to incriminate Mr. Dieckamp.

239. Mr. Moseley, now employed by the Institute of Nuclear Power Operations, testified for the Staff in the hearing on remand. He still believes that Mr. Dieckamp believed the mailgram was true. Moseley, ff. Tr. 29,816, at 4. He explained that he and Terry Harpster of the NRC Staff interviewed Mr. Dieckamp under oath and on the record on September 12, 1980, and believed then that he was sincere. *Id.* As noted, it is now our task, not Mr. Moseley's, to judge Mr. Dieckamp's credibility. However, Mr. Moseley also added objective reasons for his

²³ Staff Exh. 5 in the main hearing.

opinion. He believes that it was beyond the range of credible operator knowledge to infer that amounts of hydrogen sufficient to reach a flammable concentration in a 2 million ft³ containment would exist at 10 hours after the initiation of the event. Mr. Moseley also asserted his belief that no one present in the control room had concluded on March 28 that hydrogen caused the pressure spike. *Id.*

240. Mr. Moseley made himself available for extensive cross-examination, and in our view nothing inconsistent with his opinion was developed. He was a credible witness. Tr. 29,817, *et seq.* (Moseley). We listened to his testimony carefully and have since read many of the depositions conducted by him and the IE team in September 1980. We are satisfied that Mr. Moseley was well informed and had a basis for his opinion.

241. TMIA presented the testimony of David H. Gamble, who, during the relevant period had been employed as a criminal investigator by the NRC Office of Inspector and Auditor. He had been assigned to participate in the investigation directed by Mr. Moseley. The purpose of Mr. Gamble's testimony was to disparage the methods and results of the investigation. Gamble, *ff.* Tr. 30,522 (*passim*).

242. Mr. Gamble was not a very convincing witness and did not seem to understand the investigatory scheme used by the IE team. For example, Mr. Gamble makes the superficially shocking charge that Mr. Moseley directed that portions of the report of the investigation be drafted before the interviews. *Id.* at 2. Mr. Gamble felt that writing sections of the report based upon prior interviews and previously gathered documents tended to predetermine the conclusions. *Id.* at 4. But Mr. Gamble scarcely acknowledged the fact that the order from Mr. Victor Stello to Mr. Moseley establishing the information-flow task force, expressly and prudently directed the team to rely on available interview transcripts and testimony "to the maximum extent possible" and to conduct additional interviews only when necessary. Staff Exh. 2, at 2. There was a very large body of carefully developed, preexisting information. Even so, the IE team conducted many additional interviews which formed an important part of the conclusions of NUREG-0760.

243. As is evident throughout this Decision, the Board has cited to many of the interviews conducted by task force members Messrs. Moseley, Harpster, Craig, Hoefling, and Gamble in carrying out Mr. Stello's order to investigate the flow of information following the accident. One of Mr. Gamble's allegations is that Mr. Moseley placed unwarranted restrictions on the questioning of witnesses during the information-flow depositions. If true, the quality of the interviews would be diminished.

244. As Mr. Gamble explained, Mr. Moseley (1) established the scope of the questioning; (2) required that questions be prepared before the interview, based upon available information; (3) required that one principal questioner at a time ask questions, that other questioners defer their questions until the end of the interview or slip the question to the principal questioner at the time; (4) at the end of the planned interview, Mr. Moseley would, off the record, organize and approve followup questioning. Tr. 30,560-73 (Gamble). Mr. Gamble could not recall Mr. Moseley prohibiting any questions in any interview attended by Mr. Gamble. Tr. 30,665.

245. If Mr. Gamble had been in charge of the investigation, he would not have prepared word-for-word questions in advance and would have permitted all five of the interviewers to ask questions whenever each felt like it. *E.g.*, Tr. 30,561, 30,567. Mr. Gamble was free to ask any questions whenever he chose. *E.g.*, Tr. 30,562.

246. The Board has read the relevant portions of most, perhaps all, of the pertinent information-flow interviews. We find no sign that the questioners were frustrated. There were many followup questions. Mr. Moseley's ground rules for the interviews were logical and conducive to order, accuracy and thoroughness — not to mention fairness to witnesses. Our only criticism might be that he should not have exempted Mr. Gamble from following the protocol, but as it turned out, Mr. Gamble asked relatively few questions.

247. In sum, while the Board did not rely upon the conclusions of NUREG-0760 in this proceeding, we relied upon its underlying interviews. We find no fault with the Staff's information-flow investigation as it pertains to the Dieckamp mailgram issue.²⁴

VI. CONCLUSIONS OF LAW

248. The pressure spike and the actuation of the containment building spray system was first interpreted in terms of a hydrogen combustion at about 11:00 p.m. on March 29, 1979, by Mr. William Lowe. At that time he also concluded that the hydrogen was produced by a zirconium and water reaction in the reactor core. Several hours later he concluded that the core had been extensively damaged.

²⁴The Board has not addressed all of Mr. Gamble's criticisms of the NUREG-0760 investigation (TMLA Proposed Findings 273-283). We agree with the Staff that they are inconsequential. Moreover, they have turned out to be irrelevant. The Staff's proposed findings on Mr. Gamble's testimony accurately reflect our views. Staff Proposed Findings 57E-57P.

249. Mr. Dieckamp learned of Mr. Lowe's discovery on March 30, 1979.

250. The statements by Joseph Chwastyk that, on March 28, 1979, he knew the pressure spike was real are accurate. Mr. Chwastyk's statements that, on March 28, he knew that the pressure spike was caused by a hydrogen explosion are not accurate. His statements that on March 28 he knew that there had been a zirconium/water reaction also are not accurate.

251. The statement by Brian Mehler that he knew that on March 28, 1979, an order was given not to operate electrical equipment in order to avoid igniting hydrogen is not accurate, nor does Mr. Mehler believe his statement is accurate.

252. The statement by Theodore Illjes that on March 28, 1979, there was a discussion that a hydrogen combustion caused the pressure spike is not accurate, nor does Mr. Illjes believe it is accurate.

253. No statement by any participant to the effect that on March 28, 1979, he knew that there had been a hydrogen combustion is accurate. No one knew on March 28, 1979, that there had been a hydrogen combustion in the containment of TMI Unit 2, or that there had been a zirconium/water reaction in the reactor core.

254. On May 9, 1979, when Mr. Dieckamp sent his mailgram to Congressman Udall, he believed that it was accurate. At that time there was no evidence to the contrary. Subsequent information to the contrary is not accurate.

255. Mr. Dieckamp was deeply involved in the recovery of the accident at TMI-2. He had gathered information to present to Senator Hart's Subcommittee about the accident several weeks before the mailgram. He had a reasonable basis to believe that the mailgram was accurate and did not act in careless disregard of the facts in sending the mailgram.

256. Subsequently, when the statements of Messrs. Chwastyk, Mehler, and Illjes came to light, and when other information became available to Mr. Dieckamp that there was some evidence that someone on March 28, 1979, had interpreted the pressure spike and containment spray actuation in terms of reactor core damage or hydrogen, it would have been functionally pointless to formally notify the NRC of this information. The NRC was either the developer of that information or was receiving it simultaneously with Mr. Dieckamp. We do not reach the question as to whether Mr. Dieckamp, in the narrow legal sense, had a duty to formally notify the NRC of such information because that question is unrelated to any question of integrity.

257. From the foregoing conclusions, it necessarily follows that no relevant information was withheld.

258. This aspect of the remanded proceeding is decided without reservation or condition in favor of the Licensee.

VII. APPEALS

Any party may take an appeal from this Decision by filing a Notice of Appeal within 10 days after service of this Partial Initial Decision. Each appellant must file a brief supporting its position on appeal within 30 days after filing its Notice of Appeal (40 days if the Staff is the appellant). Within 30 days after the period has expired for the filing and service of the briefs of all appellants (40 days in the case of the Staff), a party who is not an appellant may file a brief in support of or in opposition to the appeal of any other party. A responding party shall file a single, responsive brief *only* regardless of the number of appellants' briefs filed. See 10 C.F.R. § 2.762.

THE ATOMIC SAFETY AND LICENSING BOARD

Sheldon J. Wolfe
ADMINISTRATIVE JUDGE

Gustave A. Linenberger, Jr.
ADMINISTRATIVE JUDGE

Ivan W. Smith, Chairman
ADMINISTRATIVE LAW JUDGE

Bethesda, Maryland
August 19, 1985

[The Appendices have been omitted from this publication but may be found in the NRC Public Document Room, 1717 H Street, NW, Washington, DC 20555.]

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Morton B. Margulies, Chairman
Dr. Jerry R. Kline
Mr. Frederick J. Shon

In the Matter of

**Docket No. 50-322-OL-3
(Emergency Planning)**

**LONG ISLAND LIGHTING
COMPANY**

**(Shoreham Nuclear Power Station,
Unit 1)**

August 26, 1985

In this concluding Partial Initial Decision, the Board finds no reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the Shoreham Nuclear Power Station, and therefore no operating license shall be issued.

**EMERGENCY PLANNING: STATE AND LOCAL
GOVERNMENT PARTICIPATION**

Lack of a plan for concerted action among the State, local government, and utility in response to a radiological emergency creates a risk of release to the public of conflicting and confusing information in the event of a radiological emergency at Shoreham. The State and local governments have indicated that, in an emergency, they would pursue a course of action independent of that of the utility. The absence of a cooperative effort constitutes a substantial deficiency in the Shoreham emergency plan.

EMERGENCY PLANNING: STATE STATUTES

Where State statutes prohibit the utility from performing activities essential to the successful implementation of the utility emergency plan, the Board finds that the utility does not have an adequate plan to respond to an emergency at the Shoreham Nuclear Power Station.

TECHNICAL ISSUES DISCUSSED

Relocation centers
Thyroid monitoring.

APPEARANCES

Donald P. Irwin, James N. Christman, and Kathy E.B. McCleskey, Esqs., Hunton & Williams, Richmond, Virginia, for Applicants.

Martin Bradley Ashare and Eugene R. Kelley, Esqs., Hauppauge, New York, and **Herbert H. Brown, Lawrence Coe Lanpher, Karla J. Letsche, Michael S. Miller, and Christopher M. McMurray, Esqs.,** Kirkpatrick & Lockhart, Washington, D.C., for Suffolk County, New York.

Fabian G. Palomino and Richard J. Zahnleuter, Esqs., Albany, New York, for the Governor of the State of New York.

Bernard M. Bordenick, Donald F. Hassel, Sherwin E. Turk, and Oreste Pirfo, Esqs., Bethesda, Maryland, for the Nuclear Regulatory Commission Staff.

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CONCLUDING PARTIAL INITIAL DECISION ON EMERGENCY PLANNING

Introduction

This is the second and concluding Partial Initial Decision in which the Board considers offsite emergency planning issues pertaining to the application of Long Island Lighting Company (LILCO) for an operating license for Unit 1 of the Shoreham Nuclear Power Station (Shoreham), located in Brookhaven, New York.

The first partial initial decision, LBP-85-12, 21 NRC 644, was issued April 17, 1985. Findings of fact and conclusions of law were made on contentions in the following categories: I. Human Behavior; II. Credibility and Conflict of Interest; III. EPZ Boundary; IV. LERO Workers; V. Training; VI. Notification and Information to Public; VII. Sheltering; VIII. Making Protective Action Recommendations; IX. Evacuation; XI.

The Handicapped, Hospitals, and Nursing Homes; XII. Schools; XIII. Ingestion Pathway; XIV. Loss of Offsite Power; XV. Strike by LILCO Employees; and XVI. Legal Authority Issues.

The Board did not, however, decide the contentions in Category X. Relocation Centers (24.O, 24.P, 74, 75, and 77) because the record on Contention 24.O had been reopened and was not yet complete. The contentions in that category were to be decided after the record was closed on Contention 24.O. That record was closed on June 26, 1985. Proposed findings of fact and conclusions of law were filed by LILCO (Applicant) on July 11, 1985; by Suffolk County and New York State (Intervenors) on July 16, 1985; and by NRC Staff (Staff) on July 26, 1985. Applicant filed a reply on July 26, 1985.

All of the proposed findings of fact and conclusions of law submitted by the parties have been considered. Any such finding or conclusion not incorporated directly or inferentially in this Partial Initial Decision is rejected as unsupported in fact or law or unnecessary to the rendering of this Decision.

In this concluding Partial Initial Decision the Board will decide the remaining emergency planning contentions, 24.O, 24.P, 74, 75, and 77. With this Decision, findings of fact and conclusions of law will have been made on each litigated contention. The Board here decides whether the LILCO Plan as a whole provides reasonable assurance that adequate measures can and will be taken in the event of a radiological emergency at Shoreham, as required by U.S. Nuclear Regulatory Commission (NRC or Commission) regulations, 10 C.F.R. § 50.47(a)(1). To arrive at this ultimate conclusion, we incorporate by reference the findings of fact and conclusions of law made in the first Shoreham partial initial decision, LBP-85-12, *supra*. Our Decision is made in accordance with the regulatory requirements set forth in that decision. See LBP-85-12, 21 NRC at 651-54.

X. RELOCATION CENTERS **(CONTENTIONS 24.O, 24.P, 74, 75, and 77)**

X.1. Introduction

Intervenors' contentions concerning relocation centers for the general population of the Shoreham plume emergency planning zone (EPZ) allege: (1) LILCO has not identified a relocation center for a significant number of the anticipated evacuees (24.O); (2) although LILCO relies on the American Red Cross to provide medical and counseling services for evacuees, LILCO does not have an agreement with the American

Red Cross to provide such services (24.P); (3) two of the three primary relocation centers designated by LILCO are only 3 miles from the plume EPZ boundary (74); (4) the LILCO Plan provides no estimate of the number of evacuees who may require shelter in a relocation center, and thus there is no assurance that the relocation centers designated by LILCO will be of sufficient capacity to provide necessary services for the number of evacuees that will require such services (75); and (5) the equipment LILCO plans to use to measure thyroid contamination at relocation centers will be incapable of differentiating the required signal from background readings (77). See Appendix C, LBP-85-12, 21 NRC at 979, 1020-21, for full text of these contentions.

These relocation center contentions were based on an early version of the LILCO Plan, issued in May 1983. In March 1984, LILCO and Suffolk County each filed direct written testimony on the relocation center contentions. After learning that the facilities relied upon in the original plan were not available for its use, LILCO filed supplemental testimony on June 15, 1984. Again, facilities relied upon by LILCO became unavailable. The Board allowed LILCO to replace its June 15 testimony with the testimony finally heard in this proceeding. See Cordaro *et al.*, ff. Tr. 14,707, *et seq.* That testimony did not identify the relocation center with which LILCO was then negotiating an agreement for use. Although the Board did not require disclosure of the name of the facility, the Board found the lack of an identified relocation center constituted a void in LILCO's proof on the matter. Tr. 14,806-07. Thereafter, on August 29, 1984, the record was closed.

In October 1984, LILCO submitted to the Board a letter naming the Nassau Veterans Memorial Coliseum (Coliseum) as a "reception" center for evacuees. This reception center is to serve as a central location to which evacuees should go in the event of an emergency at Shoreham. Evacuees will be monitored, and if necessary, decontaminated, at the reception center and then directed to "congregate care" centers operated by the Nassau County Chapter of the American Red Cross. LILCO did not seek to reopen the record to admit this evidence, but claimed that the identity of the reception center was merely a confirmatory item which could be admitted without reopening. At a conference of counsel on January 4, 1985, the Board ruled that LILCO could not simply insert this information into evidence without reopening the record. See Tr. 15,740.

On January 11, 1985, LILCO filed a motion to reopen the record on Contention 24.O. This motion was granted, over the objection of the County and State, on January 28, 1985. The reopening was limited to the narrow issue of the adequacy of the Coliseum to serve as a relocation

center. LILCO, Suffolk County, the State of New York, and the Federal Emergency Management Agency (FEMA) each submitted prefiled written testimony. The Board rejected, as irrelevant to Contention 24.O, testimony proffered by the State and County which did not address the functional adequacy of the Coliseum to serve as a relocation center.¹ A hearing was held on Contention 24.O in Hauppauge, New York, on June 25 and 26, 1985.

X.A. Relocation Centers for the General Public (Contention 24.O)

This contention alleges that there is no relocation center designated for a significant portion of the anticipated evacuees from the Shoreham plume EPZ. When the record in this emergency planning proceeding was closed on August 29, 1984, LILCO had not yet named a facility to be used for monitoring and decontamination of the general public in the event of an emergency at Shoreham. As noted above, the record was reopened on Contention 24.O in response to LILCO's motion to reopen, and a hearing was held on June 25 and 26, 1985, in Hauppauge, New York. The record was reopened for the narrow purpose of admitting the identity of LILCO's proposed facility and for assessing its functional adequacy to serve as a relocation center. See unpublished Memorandum and Order on Reopening of the Record, May 6, 1985.

LILCO's written testimony consisted of an Affidavit of Elaine D. Robinson with six attachments. Robinson Affidavit, ff. Tr. 15,870 and Attach. 1-6. FEMA's written testimony consisted of an affidavit of Thomas E. Baldwin, Joseph H. Keller, Roger B. Kowieski, and Philip H. McIntire, ff. Tr. 15,991. The qualifications of these witnesses have been summarized in Appendix A, LBP-85-12, 21 NRC at 923, 929. The County and State made their case on cross-examination alone.

X.A.1. Agreement for Use of the Nassau Veterans Memorial Coliseum

LILCO has designated the Coliseum as a reception center to be used for monitoring and decontamination of evacuees from the plume EPZ in the event of an emergency at Shoreham. Robinson Affidavit, ff. Tr. 15,870, at 2. The Coliseum is a sports and entertainment/exhibition complex located in the south-central Nassau County at the intersection

¹ On May 17, 1985, the County and State moved for reconsideration of the Board's May 6, 1985 order (unpublished), or in the alternative, for reopening of the record on Contentions 24.N, 24, and 25 for the purpose of admitting the testimony rejected by the Board as irrelevant to Contention 24.O. The County further requested that, if the Board ruled against the County on the reconsideration and reopening requests, the Board certify the matter to the Appeal Board. All of intervenors' requests were denied on June 10, 1985, in an unpublished memorandum and order.

of Hempstead Turnpike and Meadowbrook Parkway, 43 miles from the Shoreham site and 33 miles from the western boundary of the 10-mile EPZ. *Id.*; Tr. 15,892-93 (Robinson). The Coliseum is designed to accommodate crowds of 15,000 to 17,000. Robinson Affidavit, ff. Tr. 15,870, at 2.

The Hyatt Management Corporation of New York, Inc. (Hyatt) leases and manages the Coliseum for Nassau County. *Id.* at 1. A letter of agreement between LILCO and Hyatt, dated September 25, 1984, authorizes LILCO and the Nassau County Chapter of the American Red Cross (Red Cross) to use the Coliseum as a reception center. The letter, which was approved by Hyatt on October 8, 1984, allows LILCO to use the Coliseum and all parking lots and immediately surrounding property as a reception center for the general public, in planning for and responding to a radiological emergency at Shoreham. *Id.* The letter of agreement further provides that LILCO will be given reasonable access to the Coliseum upon notification by LILCO to Hyatt or to Nassau County that a radiological emergency has occurred at Shoreham. Reasonable access refers to the time which Hyatt would need to clear the Coliseum and parking lots if there were an event in progress at the Coliseum at the time an emergency occurred at Shoreham. According to Mr. Sumerlin, General Manager of the Coliseum, the time could range from 15 minutes to an hour and a half. Tr. 15,924-25 (Robinson). A consultant for LILCO performed an informal study and found that the parking lot was cleared in 45 minutes following the end of a capacity-crowd hockey game on Tuesday night January 8, 1985. Tr. 15,916-17 (Robinson). The Coliseum has 24-hour security which will permit LILCO to enter the building at any time. Tr. 15,924-25 (Robinson). The Board finds that the Coliseum can be cleared quickly enough to conclude that it will be available for LILCO's use in the event of an emergency at Shoreham.

The evidence shows that the Nassau County Executive intends to assist in the event of an emergency at Shoreham. The County Executive is aware of and approves of the use of the Coliseum as a reception center in a Shoreham emergency and pledges that the Nassau County Police Department will be available to assist with security and to facilitate traffic flow and parking at the Coliseum. Robinson Affidavit, ff. Tr. 15,870, Attach. 2.

The Red Cross has agreed in writing to provide Red Cross staff to assist evacuees and to direct evacuees to congregate care centers. *Cordaro et al.*, ff. Tr. 14,707, Attach. 1. Red Cross staff will coordinate with LERO monitoring and decontamination personnel to define a "clean" area from which the Red Cross will operate at the Coliseum. Robinson Affidavit, ff. Tr. 15,870, Attach. 3.

The Board finds these agreements satisfactory to provide reasonable assurance that LILCO will have access to the Coliseum in the event of an emergency at Shoreham. Further, we find that the agreement between LILCO and the Red Cross is adequate to support our conclusion that the Red Cross will provide assistance and information to evacuees at the Coliseum. The issue of whether the Coliseum itself is functionally adequate to serve as a reception center is addressed below.

X.A.2. LILCO's Planning Basis

LILCO has used an estimate of 20% of the population of the EPZ as the maximum number of persons who would require shelter in the event of an emergency at Shoreham. Cordaro *et al.*, ff. Tr. 14,707, at 18-20. This figure is based on past experience in disasters. *Id.* The maximum population of the EPZ is 160,000, thus LILCO's planning is based on a maximum of 32,000 seeking shelter. LILCO did not justify how this number could be related to the number of persons who might seek monitoring. The Board finds that the number of persons expected to seek shelter in the event of a disaster is not necessarily the same as the number of persons who might seek monitoring in the event of a radiological accident.

We accept LILCO's planning basis for the number of evacuees who might seek shelter, be processed through the relocation center and, according to NUREG-0654 § II.J.12, must thus be monitored. *See also* § X.D.1, *infra*. The record is unclear as to how the Coliseum could accommodate the evacuees of the general population who will seek monitoring and processing, aside from those seeking shelter. We therefore find that LILCO's failure to plan for those of the general population who seek only monitoring and processing constitutes a defect in the Plan.

X.A.3. Functional Adequacy of the Nassau Coliseum to Serve as a Relocation Center

The activities to be performed at the Coliseum include registration, monitoring, and decontamination of evacuees from the plume EPZ. Vehicles will be decontaminated or stored in parking lots adjacent to the Coliseum. The initial monitoring of evacuees will be done in the receiving area. Tr. 15,899 (Robinson). The purpose of the initial whole-body monitoring is to determine whether an evacuee has any contamination, either on the clothing, shoes, skin, or in the thyroid. Tr. 15,901 (Robinson). Evacuees who are free of contamination will be issued "clean"

tags and instructed to proceed to the arena lobby. Tr. 15,897 (Robinson). These evacuees will be directed to congregate care centers operated by the Red Cross. Tr. 15,898 (Robinson). Contaminated evacuees will be sent to the decontamination area. *Id.* Evacuees with thyroid contamination will be sent by ambulance to a hospital. Tr. 15,901 (Robinson). LILCO security personnel will be positioned to keep contaminated and uncontaminated individuals from mingling. Tr. 15,897 (Robinson). Contaminated evacuees will then be instructed to remove their clothing and be remonitored before showering. According to FEMA, a normal shower is a typical decontamination method. Tr. 16,033 (Keller). Ms. Robinson testified that experience has shown that in most cases contamination would only be on the clothing. Tr. 15,901-02 (Robinson). Contaminated clothing will be collected, wrapped, and transported back to Shoreham for processing. Tr. 15,907-08 (Robinson). The process of monitoring and showering may be repeated as many as four times, if necessary. Tr. 15,902 (Robinson). Any evacuees who are still contaminated after completing the showering process would be sent to a hospital for decontamination. *Id.* The Board finds that these procedures are compatible with the proposed use of the relocation center building.

The initial question concerning the functional adequacy of the Coliseum to serve as a relocation center is whether the Coliseum is large enough to accommodate the number of evacuees who may seek monitoring, and, if necessary, decontamination. The Coliseum has a receiving area of 15,500 square feet, an arena of 17,000 square feet, an exhibition hall of 59,000 square feet, and an arena lobby with 5,750 square feet of space. Robinson Affidavit, ff. Tr. 15,870, at 2. The Coliseum also has four locker rooms, with a total of thirty showers. Tr. 15,896 (Robinson). The LILCO Plan calls for use of only two of the four locker rooms, but Ms. Robinson has stated that all four would be made available if necessary. Tr. 15,885 (Robinson). Ms. Robinson testified that LILCO had decided the twelve showers in the visitors' locker rooms would be adequate. Tr. 15,896 (Robinson).

LILCO does not rely on use of the exhibition hall or arena floor since the exhibition hall is in use 30% of the time and the arena is in use 60% of the time. Tr. 15,926 (Robinson). LILCO will use the receiving area, arena lobby, and corridors, but does not specify how processing is to be accomplished for the anticipated number of evacuees, with the available facilities.

The FEMA witnesses found that they would need more details before they could approve the Plan. Tr. 16,039 (Keller). We agree with FEMA and find that the lack of information concerning the factual basis for

LILCO's conclusion that the Coliseum is adequate to serve as a relocation center is a deficiency and must be corrected.

In summary, the Board finds LILCO's overall procedures for processing evacuees at the Coliseum to be conceptually adequate. However, LILCO must provide more detail concerning the size of the areas and available facilities, and how that relates to the number of people that must be processed. Furthermore, LILCO's time estimate for monitoring must fall somewhere within the range contemplated by NUREG-0654 § II.J.12:

The personnel and equipment available should be capable of monitoring within about a 12 hour period all residents and transients in the plume exposure EPZ arriving at relocation centers.

X.B. Agreement with the American Red Cross (Contention 24.P)

This contention alleges that although LILCO relies upon the American Red Cross to provide services, including medical and counseling services, at relocation centers, LILCO has no agreement with the American Red Cross to provide such services. Thus, Intervenor's claim, LILCO's proposed protective action of evacuation cannot and will not be implemented.

LILCO presented the testimony of Matthew C. Cordaro, Frank M. Rasbury, Elaine D. Robinson, and John A. Weismantle. ff. Tr. 14,707. The FEMA panel of Thomas E. Baldwin, Joseph H. Keller, Roger B. Kowieski, and Philip H. McIntire also testified. ff. Tr. 12,174. The qualifications of these witnesses are summarized in Appendix A, LBP-85-12, 21 NRC at 921-23, 929.

LILCO's testimony includes a letter of agreement with the Nassau County Chapter of the American Red Cross (Red Cross). This agreement, signed by Frank M. Rasbury, Executive Director of the Nassau County Chapter, states that upon notification of an emergency at Shoreham the Red Cross will set up emergency centers at predesignated facilities, and that the Red Cross will staff the facilities and dispatch evacuees to additional facilities if necessary. Cordaro *et al.*, ff. Tr. 14,707, Attach. I. The Red Cross will also staff the additional facilities and will provide supplies as needed. Rasbury, ff. Tr. 14,707, at 17. Mr. Rasbury further testified that the Red Cross provides shelter, staff, food, beds, medical care, case work services, personal counseling, and other aid as necessary. *Id.* The Red Cross will not perform monitoring and decontamination at any location. *Id.* The Red Cross has participated in a drill and planning for Shoreham and will participate in additional drills in the future. Tr. 14,748 (Rasbury); Tr. 14,751 (Robinson).

The FEMA Regional Assistance Committee (RAC) review found that more information is needed on the Red Cross' responsibilities and procedures at the centers. Baldwin *et al.*, ff. Tr. 12,174, at 42. FEMA noted that there should be procedures for completing registration forms for uncontaminated individuals and that the procedures should also specify where evacuee monitoring records will ultimately be maintained. *Id.* Although Mr. Keller testified that the absence of a letter of agreement is a deficiency in the LILCO Plan, the letter was provided subsequent to his testimony. Robinson Affidavit, ff. Tr. 15,870, Attach. 3.

The Board finds that the letter of agreement between LILCO and the Red Cross is adequate to provide reasonable assurance that the Red Cross will perform the duties upon which LILCO relies in its emergency plan. Mr. Rasbury's testimony shows what the Red Cross intends to do in the event of an emergency at Shoreham.

We agree with FEMA that procedures for completing registration forms for uncontaminated individuals and for maintenance of evacuee monitoring records should be specified in the Plan. We find this to be a matter subject to Staff oversight.

X.C. Location of Relocation Centers for Evacuees (Contention 74)

This contention alleges that two of the three primary relocation centers designated by LILCO are within 20 miles of the Shoreham site. Both the Suffolk County Community College and the State University of New York at Stony Brook are only 3 miles from the plume EPZ boundary, contrary to the requirements of NUREG-0654 § II.J.10.h.

LILCO no longer relies on these three facilities to serve as relocation centers in the event of an emergency at Shoreham. Thus, we find Contention 74 is moot.

X.D. Adequacy of Shelters (Contention 75)

Contention 75 asserts that there is no assurance that the relocation centers designated by LILCO will be of sufficient capacity to provide necessary services for the number of evacuees that would require them. The Board understands this contention to challenge the adequacy of congregate care centers that have been designated by the Red Cross, and not of the Coliseum, which we addressed under Contention 24.O. We consider this contention to challenge the adequacy of designated facilities to serve the needs of evacuees seeking shelter at congregate care centers, and the ability of the congregate care centers to collectively shelter the number of evacuees stated in the planning basis.

LILCO presented the testimony of Matthew C. Cordaro, Frank M. Rasbury, Elaine D. Robinson, and John A. Weismantle. ff. Tr. 14,707. The County presented the testimony of David Harris and Martin Meyer. ff. Tr. 9777. The qualifications of these witnesses have been summarized in Appendix A, LBP-85-12, 21 NRC at 921-25.

X.D.1. LILCO's Planning Basis for Sheltering Evacuees

LILCO estimates that about 32,000 people, or 20% of the 160,000 people who reside in the 10-mile EPZ, could seek shelter. Cordaro *et al.*, ff. Tr. 14,707, at 18-20. This estimate is based on past experience in disasters and the Suffolk County planner's own conclusion that 20% is a reasonable planning number. *Id.*; Tr. 14,821 (Robinson). The facilities that would be used to house evacuees seeking shelter consist of numerous public schools and other buildings located in Nassau County. The Red Cross has agreements dating back to 1975 with all of the facilities that have been designated for use during emergencies. The Red Cross calculates that the shelters it has designated have a combined capacity of up to 48,000 people, assuming a requirement of 60 to 65 square feet per person. Cordaro *et al.*, ff. Tr. 14,707, Attach. 1, at 2; Tr. 14,744-46 (Rasbury). The County does not dispute that approximately 60 square feet per individual is adequate. Tr. 14,886-88 (Harris).

The Red Cross assessed the adequacy of the proposed shelters in Nassau County at the time that it made its agreements with each individual shelter. American Red Cross standards have been used in choosing the buildings that the Red Cross relies on for congregate care centers. These standards include consideration of adequate parking, food facilities, toilets, and showers for people who seek shelter. Cordaro *et al.*, ff. Tr. 14,707, at 23. The Red Cross constructs a shelter profile containing specific information for each facility upon which it relies. Tr. 14,777-78 (Rasbury). Most of the facilities are less than perfect regarding all the items on the Red Cross checklist; however, all those designated are satisfactory for emergency shelter. Cordaro *et al.*, ff. Tr. 14,707, at 23-24; Tr. 14,778-80 (Rasbury). The Red Cross chooses the best buildings from among those available in the community for use as shelters during a disaster. Cordaro *et al.*, ff. Tr. 14,707, at 23-25; Tr. 14,775-76 (Rasbury). If facilities become unavailable the Red Cross finds other suitable facilities.

The agreements between the Red Cross and the designated shelter facilities are revocable at will by either of the parties to the agreement. Tr. 14,768 (Rasbury). Some facilities could become unavailable at the

time of a disaster because schools' and school districts' first responsibility to their pupils might take priority over the use of school buildings as congregate care centers. Tr. 14,770 (Rasbury). The agreements for the facilities do not specify the type of emergency, although the Red Cross interprets them to mean that they will be available as public shelters in the event of natural disasters or man-made disasters without reference to the type of disaster. Tr. 14,770-71 (Rasbury). The agreements were made without specific reference to the possibility of sheltering evacuees from a radiological disaster. Tr. 14,772 (Rasbury). In the Red Cross' view, however, there is no need to distinguish the type of disaster for the purpose of judging the adequacy of the facilities, and it has not done so. A person who is displaced and requires shelter has the same basic needs regardless of the type of hazard that caused the displacement. Tr. 14,774 (Rasbury).

A list of the organizations with whom agreements are maintained for the congregate care centers is attached to the July 25, 1984 letter of agreement between LILCO and the Red Cross. Cordaro *et al.*, ff. Tr. 14,707, Attach. 1. At the time of an emergency, evacuees arriving at the reception center and needing shelter will be directed by the Red Cross to congregate care centers. The organizations named with whom the Red Cross has agreements will not be published and made available to the public in advance of an accident. One reason for this is that in some instances a particular facility may not be available. Another reason is that this will limit the ability of the public to bypass the relocation center where monitoring and decontamination will take place. Tr. 14,770, 14,779 (Rasbury); Tr. 14,825-6 (Weismantle). Congregate care centers will be designated according to need at the time of an emergency. Tr. 14,773 (Rasbury). The Board finds this to be a satisfactory means of operation that meets the legitimate needs of all concerned.

X.D.2. Board Conclusions

The Board accepts LILCO's planning basis of 32,000 evacuees as reasonable, because it is based on prior disaster experience and because the Interim plans have brought forward no contradictory evidence that would lead us to believe that planning basis is seriously underestimated. Further, we conclude that the planning basis used by LILCO is conservative and that up to 48,000 persons could be sheltered within the facilities that have been identified by the Red Cross. This is clearly an adequate margin above the planning basis for any uncertainty that exists as to the actual number of possible evacuees who may need assistance if an accident occurs at Shoreham.

The Board also concludes that it may place its confidence in the Red Cross for the assessment of adequacy of the shelters that it has identified. This confidence is based not only on the American Red Cross' extensive experience in rendering assistance to disaster victims, but also because the Red Cross was able to identify clearly the factors that go into its judgment and it has shown that it forms its judgments based on a systematic assessment.

The Board is aware, however, that the agreements between the Red Cross and the individual facilities are revocable at will and that many of the agreements were made as far back as 1975. In light of the possibility of out-of-date agreements the Board concludes that LILCO should confirm that the agreements between Nassau County shelter facilities and the Red Cross remain in effect. In the event that some agreements are not confirmed, we would expect that the Red Cross would find other suitable facilities, according to their normal procedures, that would be able to shelter the anticipated number of evacuees.

The Board finds that the facilities to be made available are adequate and that the Red Cross has adequate procedures to provide others if needed. We leave the matter of review of the confirmed Red Cross agreements to Staff oversight.

X.E. Thyroid Monitoring Equipment at Relocation Centers (Contention 77)

Contention 77 asserts that the thyroid monitoring equipment to be used at relocation centers is not sufficiently sensitive to accurately detect 150 counts per minute (CPM) in the presence of background readings that are likely to exceed 50 CPM.

LILCO presented the testimony of Matthew C. Cordaro, Charles A. Daverio, and Michael L. Miele. ff. Tr. 13,755. FEMA's witnesses were Thomas E. Baldwin, Joseph H. Keller, Roger B. Kowieski, and Philip H. McIntire. ff. Tr. 12,174. The qualifications of these witnesses are described in Appendix A, LBP-85-12, 21 NRC at 921-22, 929. Intervenors presented no testimony on this contention.

X.E.1. LILCO's Monitoring Procedures

LILCO will use an Eberline RM-14 survey meter with HP-270 probe to measure thyroid contamination at relocation centers. Cordaro *et al.*, ff. Tr. 13,755, at 5 and Attach. 3. LILCO will also use the same meter with a tungsten-shielded HP-210 probe when a more sensitive instrument is called for; for example, at times when elevated background

levels are present, or to monitor children's thyroids. *Id.* at 9-10 and Attach. 4; Tr. 13,756-62 (Daverio, Miele). The tungsten-shielded probe is between three and four times more sensitive than the HP-270 probe and is capable of detecting thyroid contamination in the presence of background levels at least four times greater than would be possible with the HP-270 probe. *Id.*; Tr. 13,787-92 (Miele). LILCO commits to using the more sensitive probe where appropriate and to including procedures for its use in future revisions of the LILCO Plan. Cordaro *et al.*, ff. Tr. 13,755, at 9.

In conducting its monitoring operations, LILCO will separate areas for whole-body monitoring from areas devoted to thyroid monitoring, and evacuees will not have their thyroids monitored until after it is determined that they are not contaminated or, if contaminated, that they have been decontaminated. Tr. 14,280 (Keller); OPIP 3.9.2, §§ 5.6 and 5.8. Monitoring personnel are trained to set up separate areas for whole-body and thyroid monitoring. Babb *et al.*, ff. Tr. 11,140, at Attach. 20, module number 10, § I, at 3, 5-11, 19-20. Monitoring personnel are also trained to have persons enter the building through a controlled route and to conduct whole-body monitoring at a station close to the contaminated area and which will be blocked off from clean areas by appropriate barriers. *Id.* at 5.

If whole-body monitoring discloses that a person is contaminated, that person will be directed to decontamination areas along controlled routes and will not be allowed to enter any clean areas. *Id.* at 3. Monitoring personnel will use the criterion of 150 CPM over background as a threshold for determining that persons with contaminated thyroids should be sent to a hospital for medical care. That criterion functions as a general guideline to monitoring personnel rather than as a sharp threshold. Thus, the 150-CPM threshold is a qualitative rather than a quantitative guideline. Tr. 13,774-76 (Miele). The basic concern is simply to conduct monitoring to determine if the dose to the thyroid is substantial enough to warrant further action. Cordaro *et al.*, ff. Tr. 13,755, at 8-9; Tr. 13,772-77 (Miele). The qualitative guideline is adequate, in LILCO's view, because the 150-CPM threshold is well below the 5-rem exposure level at which protective action is recommended. Radiation monitoring personnel would have to misread a thyroid reading by 600 CPM before the public safety would be endangered. Tr. 14,276-77 (Keller). FEMA witnesses believe that this would be extremely unlikely and there is nothing in our record to suggest that errors of that magnitude could occur. *Id.*

X.E.2. Intervenors' Concerns

Intervenors assert that LILCO's procedure for the use of its monitoring instrument is inadequate for three reasons: (1) The procedure indicates that the background reading should be taken with the shield of the HP-270 probe open when it should be taken with a closed shield; (2) the present procedure does not indicate that the meter is to be set for a fast response time; and (3) the procedure does not include special provisions for monitoring the thyroids of children. I.F. 645, 648, 649. There is no dispute regarding the validity of the three errors noted by the Intervenors in LILCO's procedures. Both Applicant and Staff agree that the three items constitute errors in LILCO's Plan. A.F. 537, S.F. 605.

LILCO has committed to revise its Plan (1) to reflect that both background radiation and thyroid contamination readings are to be conducted with a closed shield (Tr. 13,794 (Daverio)); (2) to indicate that the RM 14 meter with HP-270 probe is to be set on a fast response time (Tr. 13,795 (Daverio)); and (3) to include special provision for monitoring children with an HP-210 probe. *Id.* The Board accepts LILCO's commitment to remedy the defects in its Plan regarding its use of instruments and monitoring of thyroids.

Intervenors did not press in their proposed findings the claim stated in the contention that backgrounds above 50 CPM are likely. This is reasonable since the record shows without contradiction that it is unlikely that background radiation levels at relocation centers more than 20 miles from Shoreham would ever exceed 50 CPM. Tr. 14,578 (Keller).

Intervenors point out that LILCO's Plan states that background radiation levels should remain less than 50 CPM but that LILCO's witnesses testified that LILCO intends to delete this statement because if background is less than 350 CPM it would not affect survey measurements. Cordaro *et al.*, ff. Tr. 13,755, at 7-9. FEMA witnesses testified that it is neither desirable nor prudent to attempt to measure a thyroid contamination in a background of more than 50 CPM and that the provision should not be deleted. Tr. 14,278-81, 14,610 (Keller). The NRC Staff agrees that background readings of 50 CPM as stated in the plan should not be altered. S.F. 604, n.45. The Board agrees with FEMA and the Staff that LILCO should retain the provision stating that permissible background levels during thyroid monitoring should not be above 50 CPM.

The Intervenors are also concerned that when monitoring instruments are set on fast response times, accurate readings are difficult to make because of fluctuations in background radiation, statistical variations in the number of counts, and needle fluctuations. I.F. 648. These concerns are without merit because there are adequate margins between the nominal

levels proposed in the plan for screening evacuees and levels which could cause harm to public health. Thus, even if substantial errors were made in reading instruments, public health would not be threatened. Further, it seems to the Board implausible that even a fluctuating meter could be misread by some 600 CPM. We also note that, while the Applicant's threshold number stated for the purpose of planning is 150 CPM, persons doing the monitoring are instructed to use conservative judgment in implementing that plan and that thyroids showing count rates less than that level would also trigger the monitoring personnel to send such individuals to the hospital.

X.E.3. Board conclusions

The Board concludes that LILCO has outlined an adequate plan for thyroid monitoring of evacuees in the event of an accident at Shoreham. The Applicant's plan provides for the use of instruments of suitable sensitivity and for procedures which will assure that thyroid monitoring will not take place in contaminated areas where backgrounds are likely to be excessive due to radiation tracked in by contaminated evacuees. The evidence is also clear that there is virtually no possibility that there will be excessively high background levels as a result of direct contamination from the plant. Thus we conclude that the problem postulated in the mention of excessively high background readings during thyroid monitoring is speculative and virtually nonexistent.

The three errors in LILCO's monitoring procedures noted in Intervenor's proposed findings are agreed to by all parties. We conclude that the remedies proposed by LILCO are simple and adequate and should be adopted. Intervenor's request that they be provided an opportunity to review procedures is unnecessary. The Board finds LILCO's commitment to remedy the defects to be acceptable and delegates assessment of compliance to the NRC Staff. We further conclude that LILCO should not revise its Plan so as to permit background levels higher than 50 CPM during thyroid monitoring.

We conclude that LILCO has met its burden of proof on Contention 77.

Opinion and Findings

From the evidence of record the Board finds that no operating license shall be issued. We make this finding because the LILCO Plan does not provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at Shoreham, as

required by 10 C.F.R. § 50.47(a)(1). This determination is not based upon a finding that there is anything unique about the demography, topography, access routes, or jurisdictional boundaries in the area in which Shoreham is located. To the contrary, the record fails to reveal any basis to conclude that it would be impossible to fashion and implement an effective offsite emergency plan for the Shoreham plant.

Our review of the LILCO Plan has disclosed not only the fatal defects upon which we base the denial, but other deficiencies discussed below. It should be stated at this point, that inasmuch as it is the LILCO Plan, the inadequacies are ascribable to LILCO. However, to a significant degree the inadequacies resulted from and have been aggravated by Suffolk County's and New York State's opposition to the Plan.

The existing regulatory scheme provides for the participation of State and local governments with the utility to assure the success of emergency planning.² There is a fundamental assumption that there will be an integrated approach to emergency planning among the three. The State and County have decided not to follow the route contemplated by the Federal rules. Although we do not find their opposition to the emergency plan for Shoreham to be contrary to law, that action has helped to create a barrier to the implementing of an acceptable emergency plan.

Our holding is not contrary to the Commission's decision in *Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), CLI-83-13, 17 NRC 741 (1983), which held that it was possible for a utility plan, submitted in the absence of State and local government-approved plans, to meet the prerequisites for the issuance of an operating license. A condition of licensing is that the applicant has the burden of showing that its plan meets all applicable regulatory standards. This LILCO has failed to do.

The emergency plan LILCO proffered for Shoreham requires the utility to perform all essential functions necessary for successful implementation of the Plan. The essential functions extend from conducting the evacuation, to making decisions and recommendations to the public concerning protective actions, and to performing access control at various sites. The activities found to be beyond LILCO's legal authority to perform are as follows: (1) guiding traffic; (2) blocking roadways, erecting barriers in roadways, and channelling traffic; (3) posting traffic signs on roadways; (4) removing obstructions from public roadways, including towing private vehicles; (5) activating sirens and directing the broadcasting of emergency broadcast system messages; (6) making decisions and

² That expected participation extends to the point where responsibility for activating the public notification system is placed with the governmental authorities. See 10 C.F.R. Part 50, Appendix E, § IV D.2.

recommendations to the public concerning protective actions; (7) making decisions and recommendations to the public concerning protective actions for the ingestion exposure pathway; (8) making decisions and recommendations to the public concerning recovery and reentry; (9) dispensing fuel from tank trucks to automobiles along roadsides; and (10) performing access control at the Emergency Operations Center (EOC), the relocation centers, and the EPZ perimeters.

It is beyond LILCO's legal authority to conduct such activities. See Board Findings XVI.1-4 (LBP-85-12, 21 NRC at 896-919). Thus LILCO has a proposed plan which cannot lawfully be implemented. See Board Findings XVI.5 (21 NRC at 919), wherein we state that the activities LILCO seeks to perform as specified in Contentions 1-10 are unlawful, leaving LILCO without an implementable, comprehensive, and effective emergency response plan for Shoreham. Needless to say, these circumstances alone are adequate to support a denial of approval of the emergency response plan, under 10 C.F.R. § 50.47(a)(1). LILCO had previously acknowledged that the lack of legal authority, if upheld, would prohibit it, by itself, from implementing its emergency plan regardless of the substantive merits of the Plan. *Id.*

Having found that Applicant does not have a workable emergency response plan for Shoreham because of the legal impediment to LILCO's implementation of its Plan, there is no ground upon which to base a temporary solution for providing an emergency plan for the facility, in the manner contemplated by 10 C.F.R. § 50.47(c)(1).

Even if we had found that LILCO had the necessary legal authority to implement the proposed Plan, the Plan remains inadequate because of the ramifications of the refusal of the State and County to participate. To achieve an effective emergency response, the Commission's emergency planning regulations and guidance provide for a cooperative, comprehensive, preplanned, and implementable effort on the part of the utility, the State, and the local government. The Shoreham emergency plan lacks such an integrated approach. Here each entity is free to go its own way during an emergency. This is the antithesis of what the regulatory scheme calls for to achieve a satisfactory emergency response.

Lack of participation by the State and County in the emergency plan was found to diminish the Plan's effectiveness in important areas. We have concluded as to Contention 92, which alleges that there is no New York State emergency plan for dealing with an emergency at Shoreham, that this lack of State participation constitutes a serious substantive deficiency in emergency preparedness. There is no reasonable assurance that there will be cooperation between New York State and the utility during an emergency, given the former's recalcitrant position in this

matter. As a result, public health and safety cannot be protected as well by LILCO acting alone as it could if LILCO were acting in concert with the State and County. See Board Finding XIII.C.6 (LBP-85-12, 21 NRC at 884-85).

The regulatory scheme contemplates that command and control decisions will be made by State and local governments during radiological emergencies to assure independence and objectivity in decisionmaking. The LILCO Plan does not provide a result comparable to that contemplated by the regulations because its supporting command and control organization's decisionmakers have not been removed from LILCO's influence. See Board Findings II.A.3 and II.A.6 (21 NRC at 682, 686).

LILCO had given adequate consideration to the evacuation shadow phenomenon in its emergency planning process so that the LILCO evacuation plan for Shoreham is technically adequate in that respect, if implemented as LILCO has outlined. But the Board's finding to that effect strongly depends on there being clear, nonconflicting notice and instructions to the public at the time of an accident. If confused or conflicting information were disseminated at the time of an accident the evacuation and protective actions planned for could be jeopardized. The lack of assurance of integrated action between the State and local government and the utility constitutes a substantive deficiency in the Plan and diminishes the Board's confidence that public health and safety could be protected as well by LILCO acting alone as with State and local governments. See Board Finding I.A.12 (21 NRC at 669-70).

The foregoing illustrates that the refusal of New York and the County to participate in emergency planning creates situations in which the LILCO Plan can be made unworkable at any time. To the extent that this potential continues to exist, the Board cannot make a finding that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at Shoreham.

The Board found additional defects of a lesser magnitude in the Plan. These defects can be remedied and such corrections should be in place by the time the plant commences operations, should it be licensed. They involve the following:

1. Specified schools in Terryville, Riverhead, and Port Jefferson, New York, shall be included within the plume EPZ. See Board Findings III.4 and III.6 (LBP-85-12, 21 NRC at 703-04, 705).
2. The informational brochure must contain a statement that radiation can cause injury or death. See Board Finding VI.E.4 (21 NRC at 769-70).

3. LILCO shall incorporate a reasonable summary of the results of its sensitivity analysis contained in KLD Tm-140 into Appendix A of the Plan. See Board Finding IX.A.17 (21 NRC at 794-95).
4. The Plan shall contain bounded estimates of uncertainty in evacuation times in addition to point estimates. Corrections of traffic control strategies identified by the Suffolk County Police shall be incorporated in Appendix A of the Plan. See Board Finding IX.A.30 (21 NRC at 805-09).
5. A letter of agreement to provide support services shall be entered into between LILCO and the Central Suffolk Hospital. See Board Finding XI.B.5 (21 NRC at 870-11).
6. Reception centers must be identified for residents of special health care facilities within the EPZ. In addition, supporting agreements for the use of such facilities must be obtained. See Board Finding XI.B.12 (21 NRC at 840).
7. The Plan is deficient and must be corrected because LILCO's agreements for obtaining buses for use in an emergency are subordinated to preexisting contracts for normal daily use by schools outside of the EPZ. See Board Finding XII.22 (21 NRC at 872-74).
8. The Plan is defective and must be corrected because reception centers have not been identified for schoolchildren. See Board Finding XII.6 (21 NRC at 860). Without the identification of such a center, or centers, for schoolchildren it is impossible to calculate how long it might take to evacuate these children. Since multiple bus runs may be necessary, we find that the time required to transport schoolchildren to their reception center must be calculated. This calculation cannot be made until LILCO has identified the location to which schoolchildren will be taken. In addition, the Plan is considered deficient in that it has not been shown that the evacuation of schoolchildren can be accomplished within about the same time as an evacuation of the general population. See Board Finding XII.22 (21 NRC at 872-74).
9. LILCO must plan for the alteration of early dismissal procedures to conform to the protective actions recommended for the general public. See Board Finding XII.11 (21 NRC at 863).
10. LILCO's emergency plan contains provisions for monitoring only evacuees who may seek shelter in the event of an emergency at Shoreham. See Board Finding X.D.2 (pp.

422-23, *supra*). LILCO must plan for monitoring of all evacuees from the EPZ who seek monitoring, whether or not these evacuees seek shelter.

11. LILCO must provide further details as to how the Coliseum will adequately accommodate the anticipated number of evacuees seeking monitoring, and, if necessary, decontamination, and must comply with the requirements of NUREG-0654 § II.J.12. See Board Finding X.A.3 (pp. 417-19, *supra*).
12. Should a license be granted, and should LILCO continue to rely upon LERO for its emergency response, if the plant is shut down because of a strike, refueling would only be permissible under the conditions set forth in the first partial initial decision, and a request to perform other operations during shutdown would require an application for a license amendment. See Board Finding XV.C.2 (LBP-85-12, 21 NRC at 894-95).

The Board has concluded that the LILCO Plan is fatally defective on two grounds. The first is that the Applicant does not have the legal authority to implement the plan it submitted. The second is that the opposition of the State and County to the Plan has created a situation where at any given time it is not known whether the Plan would be workable. Also, as we have seen, Applicant would have to perform with secondary resources, absent State and County involvement, even if it had the necessary authority to implement the Plan. For example, its command and control decisionmakers do not have the independence and objectivity of those in State and local government. Also, the State and County have chosen to operate on independent courses during an emergency at Shoreham. This sets the stage for the dissemination of conflicting and confusing information, even if unintended. The views of the State and County on what actions should be taken in response to an emergency differ markedly from those of LILCO. This creates a real potential for the defeat of a successful response to an emergency at Shoreham.

Under the circumstances of this proceeding, at this time, the Board is justified in finding under 10 C.F.R. § 50.47(a)(1) that an operating license for a nuclear power reactor shall not be issued to LILCO. Unlike the situation in *Commonwealth Edison Co.* (Byron Nuclear Power Station, Units 1 and 2), ALAB-770, 19 NRC 1163 (1984), the significant deficiencies found in LILCO's Plan are not in the process of being corrected, so that a final decision should be withheld. Here, one fatal flaw to the successful implementation of the Plan was found to exist because of a lack of legal authority on the part of the Applicant. We have no reason to believe this defect can be corrected in the near term. The other defect

involves entities with whom the Applicant is at an impasse. The parties are entitled to a timely decision so that they can choose their future course of conduct and have the opportunity to pursue it.

Conclusions of Law

Based upon review of the entire record in the proceeding on offsite emergency planning, culminating in the findings of fact in the first and this Partial Initial Decision, the Board concludes that there is no reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at Shoreham, and therefore no operating license shall be issued for the nuclear power reactor, as is authorized by 10 C.F.R. § 50.47(a)(1).

Order

It is hereby ordered that no operating license shall be issued to LILCO for the Shoreham Nuclear Power Station, Unit 1, absent a finding that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at Shoreham, as is required by 10 C.F.R. § 50.47(a)(1).

Finality and Appealability

Pursuant to 10 C.F.R. § 2.760 this Concluding Partial Initial Decision will constitute the final decision of the Commission 30 days from the date of its issuance, unless an appeal is taken in accordance with 10 C.F.R. § 2.762 or the Commission directs otherwise. *See also* 10 C.F.R. §§ 2.785 and 2.786.

Under § 2.762 any party may take an appeal from this Decision by filing a Notice of Appeal within 10 days after service of this Partial Initial Decision. Each appellant must file a brief supporting its position on appeal within 30 days after filing its Notice of Appeal (40 days if the Staff is the appellant). Within 30 days after the period has expired for the filing and service of the briefs of all appellants (40 days in the case of the Staff), a party who is not an appellant may file a brief in support of or in opposition to the appeal of any other party. A responding party

shall file a single, responsive brief only, regardless of the number of appellants' briefs filed.

THE ATOMIC SAFETY AND
LICENSING BOARD

Morton B. Margulies, Chairman
ADMINISTRATIVE LAW JUDGE

Dr. Jerry R. Kline
ADMINISTRATIVE JUDGE

Mr. Frederick J. Shon
ADMINISTRATIVE JUDGE

Dated at Bethesda, Maryland,
this 26th day of August 1985.

APPENDIX A

Exhibits

Exhibit Number	Description	Identified at Transcript Page	Disposition at Transcript Page*
S.C. 95	Letter from Vincent Souzzi, dated 4/8/85	15,885	15,890 denied*
S.C. 96	Letter from Hannah Komanoff, dated 5/17/85	15,886	15,890 denied
S.C. 97	Letter from Leon Campo, dated 2/12/85	15,933	15,945 denied

*Denied — denied admission at this page.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Peter B. Bloch, Chairman
Dr. Kenneth A. McCollom
Dr. Walter H. Jordan
Herbert Grossman, Esq.

In the Matter of

Docket Nos. 50-445-OL&OL-2
50-446-OL&OL-2
(ASLBP No. 79-430-06-OL)

**TEXAS UTILITIES ELECTRIC
COMPANY, *et al.***
(Comanche Peak Steam Electric
Station, Units 1 and 2)

August 29, 1985

In this Memorandum and Order, the Licensing Board declines to adopt Applicants' Management Plan as the sole basis for continued litigation of this case, holding that a hearing may be terminated and unresolved issues turned over to the Applicants and Staff only when the tasks left to be done are merely confirmatory of plant safety.

**RULES OF PRACTICE: APPLICANTS' PROGRAM PLAN
NOT A PROPER FOCUS FOR HEARINGS**

Where Applicants sought to exclude litigation of prior QA/QC and design practices because of a comprehensive program of reexamination of the safety of the plant, it would not be proper to determine whether the study adequately resolves the issues until the results of the study are available for examination and challenge.

RULES OF PRACTICE: DISCOVERY

Where Intervenor's sought an order to require Applicants to preserve plant components removed from the plant for design deficiencies but did not provide any authority for such an order, the criteria for a stay are not met and Intervenor's do not meet discovery criteria because they are not seeking access to information.

RULES OF PRACTICE: SUMMARY DISPOSITION

Where the information being collected by Applicants was sufficiently important to warrant the delay, the Board granted Applicants an indefinite continuance in their obligation to respond to summary disposition motions being addressed pursuant to the Management Plan.

LICENSING BOARD: RESPONSIBILITIES

Although a major study of plant safety may not be left solely for Staff examination and be excluded from the hearing process when the study is relevant to an admitted contention, it may be possible to exclude the final stages of the study after the earlier stages have demonstrated its adequacy and only similar tasks are left to be performed.

MEMORANDUM AND ORDER (Proposal for Governance of This Case)

Memorandum

This Memorandum addresses crucial procedural issues raised by Texas Utilities Electric Company, *et al.* (Applicants) in "Applicants' Current Management Views and Management Plan for Resolution of All Issues" (Management Plan), June 28, 1985.¹ It also addresses issues raised by CASE in "CASE's Proposal Regarding Design/Design QA Issues in Response to Applicants' 6/28/85 Current Management Views and Management Plan for Resolution of All Issues" (CASE's Proposal) August 15, 1985.

¹ Citizens' Association for Sound Energy (CASE) responded on July 29, 1985 (Initial Response), and on July 16 (Mootness Response) and the Staff of the Nuclear Regulatory Commission (Staff) responded on August 2, 1985 (Staff Response).

The Board finds that it would not be proper to adopt the Management Plan as the sole basis for continued litigation of this case. The Plan contemplates complex factual and legal determinations. Focusing the entire proceeding on the adequacy of the Plan, prior to its execution, would abnegate our responsibility to determine the merits of CASE's contention. This would be particularly ironic because CASE raised many of the design and quality assurance issues that are being addressed by the Management Plan.

We have only limited authority to terminate this proceeding when there are analyses to be completed. Termination is appropriate only if the analyses are merely confirmatory of the adequacy of the plant. However, the currently proposed plan is not just a confirmatory analysis.² It is necessarily more vague than Applicants' previous plan, which Applicants failed to fulfill. The new Plan is addressed to a wide variety of significant issues that have not been adequately addressed by Applicants.

Although we reject the Plan as the sole basis for litigation, Applicants' commitment to the Plan is substantial and its careful implementation would provide important new information. Hence, it would not be proper to require Applicants to respond to Intervenor's pending summary disposition motions before they can complete work on their Plan.

There would be little purpose in addressing a substantial portion of this proceeding to the adequacy of the Plan itself. In a sense, the Plan is Applicants' internal management document for the process by which it plans to demonstrate the adequacy of its plant. On a grand scale, it is like a lawyer's trial preparation plan. Like the lawyer's plan, however, the success of the Plan will depend largely on the skill with which it is implemented. Thus, there is no reason for CASE, at this time, to file contentions about the Plan or about the Comanche Peak Response Team (CPRT) Plan.³

Although we will forego any extensive effort to judge the adequacy of the Plan prior to its implementation, we have read it and considered the

² *Consolidated Edison Co. of New York* (Indian Point Station, Unit 2), CLI-74-23, 7 AEC 947, 951 (1974), citing *Wisconsin Electric Power Co.* (Point Beach Nuclear Plant, Unit 2), CLI-73-4, 6 AEC 6 (1973) (the mechanism of post-hearing findings is not to be used to provide a reasonable assurance that a facility can be operated without endangering the health and safety of the public); *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit No. 1), ALAB-729, 17 NRC 814 (1983) (post-hearing procedures may be used for confirmatory tests); *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-811, 21 NRC 1622 (1985) (once a method of evaluation had been used to confirm that one of two virtually identical units had met the standard of a reasonable assurance of safety, it was acceptable to exclude from hearings the use of the same evaluation method to confirm the adequacy of the second unit); see also Staff Response at 915-18. The Board agrees with the Staff's statement at the bottom of page 18, that we should require evidence of the "adequacy of, the scope of, and corrective actions resulting from, the CPRT Program."

³ We encourage CASE to continue cooperating with the Staff by promptly alleging deficiencies for Staff to consider.

comments made on it. There are areas of the Plan that concern us. For the purpose of providing guidance to the parties, we have reached the following tentative, preliminary and nonbinding conclusions:

1. If the Comanche Peak Response Team Program Plan (CPRT Plan) is revised to address concerns raised in this Memorandum and is carefully and appropriately implemented, it may demonstrate both the quality of plant and the extent to which management has fulfilled its responsibility to comply with the FSAR, Commission regulations, and plant quality.
2. The lack of independence of the CPRT from management may seriously affect our willingness to accept the CPRT's findings, particularly with respect to management's responsibilities. Consequently, the lack of independence might affect the admission of evidence concerning past QA/QC failures and management's responsibility for those failures.
3. Applicants will have to demonstrate that the deficiencies identified by the CPRT are adequately resolved.
4. The CPRT must adequately resolve the Staff's Technical Review Team's (TRT) findings concerning deficiencies in the original QA/QC programs⁴ for construction and design. This concern is relevant to whether reinspections by the use of samples are adequate to assure plant safety.
5. The CPRT's resolution of all significant TRT findings that are relevant to Contention 5 may be litigated in this case.
6. We will await the CPRT's consideration of the summary disposition questions raised by Applicants and by CASE, notwithstanding Applicants' request that we no longer consider entering summary disposition in their favor on the basis of these motions.
7. The CPRT should address the extent to which there have been design errors or insufficiently complete design documents at Comanche Peak and it should consider the root cause of these errors. Consideration should be given to whether Applicants incorrectly defended design errors or incomplete design documents before this Board.
8. It would be useful for CYGNA to continue reviewing design issues that it has identified until it reaches independent conclusions about the adequacy with which its concerns have been re-

⁴ NUREG-0797, SER Suppl. No. 11 (May 1985). The TRT found, at page P-35, that "[t]he pattern of failures by QA and QC personnel to detect and document deficiencies suggests an ineffective B&R and TUGCO inspection system. This pattern . . . challenges the adequacy of the QC inspection program at CPSES on a system-wide basis."

solved. CYGNA should maintain its independence from the CPRT, Texas Utilities Electric Company and other site organizations.

9. Applicants must implement an adequate QA/QC program for the CPRT.
10. Applicants cannot be immune from litigating the prior QA/QC program and, at the same time, rely on that program to add confidence to the adequacy of the plant. (See Management Plan at 42.)
11. While, in general, closed issues need not be relitigated, further investigation by the CPRT, CYGNA or the TRT may cast doubts upon the validity of our earlier findings. In that event, these closed issues may become eligible for reassessment by the Board.

Some other questions that concern us are:

- Whether Applicants consistently complied with their FSAR design commitments.
- Whether the samples are properly structured⁵ and whether the populations are defined to include: (a) equipment removed from the plant for design or other reasons, and (b) equipment recently added to the plant or soon-to-be added to the plant.
- Whether it would be useful or necessary to destructively evaluate components removed from the plant or to use nondestructive evaluation techniques, in addition to visual inspection, to assess welds.⁶
- How the CPRT will address management's responsibility for: (a) apparent QA/QC management failures with respect to coatings and to the liner plate; (b) failure to disclose one or more management studies to CASE pursuant to discovery requests; (c) possible inadequacies in the technical analyses contained in Applicants' filings in this case, including its summary disposition filings; (d) the implications of the "destructive inspection" and the transfer of workers as they relate to the t-shirt incident;

⁵ See "Staff Evaluation of Comanche Peak Response Team Program Plan," Rev. 2 ("Evaluation") at 5 (breadth), 6 (basis for selection, sample size), 9 (issues addressed), 10 (exclusion of vendors), 11 (method of establishing populations), 13-14 (criteria for expanding samples).

⁶ CASE's motion to preserve pipe supports and other components being removed from the plant is denied. CASE has not persuaded us that it has met the standard for issuance of a stay or injunction, and its motion does not appear to be a motion for discovery since it does not announce any intention to collect data about the affected components in the near future. The questions CASE has raised go to the adequacy of the sample being taken by Applicants and to the possible need for destructive evaluation of removed components. These issues go to the credibility of the proof Applicants will present and do not require action by the Board at this time.

(e) Applicants' conduct with respect to Mr. Lipinski and to witness F, both of whom appear to have made at least some charges of technical validity; (f) the handling of Atcheson, Hamilton and Dunham; (g) the handling of other allegations of intimidation of QA/QC and craft personnel; (h) the attempt to defend the quality of QA/QC for coatings and for the liner plate; (i) the apparent inability to understand and properly evaluate the engineering contentions of Mark Walsh and Jack Doyle, including the apparently erroneous argument that Applicants' engineering practices were standard industry practice; and (j) other problems of documentation and workmanship.

- Proper qualification of the QA/QC inspectors used in the CPRT's work.⁷
- The acceptability of CPRT work done before a QA/QC plan was approved or implemented.
- How Applicants or the CPRT will assess the adequacy of repairs made pursuant to its recommendations and how this assessment will be done in a way that makes it reviewable by the Staff and by CASE.
- How the CPRT will discharge its responsibility to find root causes and patterns of deficiencies.
- The suitability of acceptance criteria and the way in which trends will be used to establish corrective action.⁸
- Information concerning the independent design review conducted by a professor.
- Whether generic concerns with QA/QC require additional verification of QA/QC for welding and, if so, the suitability of the inspection attributes being used by the CPRT, particularly with respect to welds covered by paint.
- The acceptability of CYGNA's current role as independent design reviewer.
- The completeness of the CPRT's list of issues.⁹

Despite these reservations, it is appropriate to defer consideration of issues raised by CASE in its summary disposition motions. If Applicants are successful, then the completed plan will withstand challenges brought by CASE. One form of challenge CASE might bring is a statement that it intends to prove a certain fact about the plant and that, assuming that fact to be true, Applicants' plan has not adequately re-

⁷ Evaluation at 11.

⁸ *Id.* at 13.

⁹ *Id.* at 9; Staff's Response at 21-25.

sponded to that fact. Another form of challenge is that there are specific reasons (set forth) that Applicants' plan, as implemented, is not adequate to carry their burden of proof to demonstrate the safety of the plant. Still other challenges are possible, which is precisely the state of the world whenever a company prepares its responses to a complex set of allegations. Although this undoubtedly will make things difficult for Applicants, it is nevertheless the only fair way to proceed at this time.

It is difficult to forecast when hearings in this case will be concluded. Much of the difficulty relates to the standard restricting the tasks that may be performed subsequent to the close of hearings. Such subsequent tasks must be merely confirmatory of the adequacy of the plant. Whether or not tasks are confirmatory will, at some future time, become a matter of judgment. Should it be demonstrated that enough work has been done on the CPRT Plan to show its carefulness and comprehensiveness and to establish a pattern for a similar portion of work yet to be done, then the remaining tasks could be considered confirmatory.

This ruling may necessitate substantial proceedings that will delay the operation of Comanche Peak. The number of important issues and the length of hearings that may be required are not a source of comfort to this Board. Although apparent "expedition" could have been accomplished by accepting Applicants' plan at this time, regrettably, the easy road for this case is not the proper one. The parties are encouraged to cooperate in the interest of limiting the work that lies before us all.

Order

For all the foregoing reasons and based on consideration of the entire record in this matter, it is, this 29th day of August 1985,

ORDERED:

Texas Utilities Electric Company, *et al.*'s request that Docket 2 be declared moot is denied; and its motion that we adopt its Management Plan also is denied. Similarly, Citizen Association for Sound Energy's

Proposal relating to summary disposition motions and to the status of Cygna Energy Services is denied.

THE ATOMIC SAFETY AND
LICENSING BOARD

Peter B. Bloch, Chairman
ADMINISTRATIVE JUDGE

Walter H. Jordan
ADMINISTRATIVE JUDGE

Kenneth A. McCollom
ADMINISTRATIVE JUDGE

Herbert Grossman
ADMINISTRATIVE JUDGE

Bethesda, Maryland

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

James P. Gleason, Chairman
Dr. Jerry R. Kline
Mr. Glenn O. Bright

In the Matter of

Docket Nos. 50-440-OL
50-441-OL
(ASLBP No. 81-457-04-OL)

**CLEVELAND ELECTRIC ILLUMINATING
COMPANY, et al.**

(Perry Nuclear Power Plant,
Units 1 and 2)

August 30, 1985

In this Memorandum and Order, the Licensing Board denies Intervenor's motion to reopen the record and submit a new contention finding that Applicants' request for exemption was properly filed under the provisions of 10 C.F.R. § 50.12 and need not have been presented by petition pursuant to 10 C.F.R. § 2.758.

REGULATIONS: EXEMPTION OR WAIVER

When a request for exemption from a Commission regulation does not contend that application of the rule or regulation would not serve the purpose for which it was adopted, but rather that its application would result in costly delays in operation, that request is properly filed under 10 C.F.R. § 50.12 and need not be the subject of a petition pursuant to 10 C.F.R. § 2.758.

REGULATIONS: EXEMPTION OR WAIVER

When a request for exemption from a Commission regulation is not directly related to a contention in the proceeding, and does not involve such serious safety, environmental, or common defense and security matters as to warrant the Board's raising issues on its own initiative, the request is properly filed pursuant to 10 C.F.R. § 50.12 and need not be the subject of a petition under 10 C.F.R. § 2.758.

MEMORANDUM AND ORDER (Motion to Reopen Record and Submit New Contention)

The Ohio Citizens for Responsible Energy (OCRE), Intervenor, filed a motion, opposed by the Applicants and Staff, to reopen the record and submit a new contention. The motion is directed at an exemption requested by Applicants from the provisions of 10 C.F.R. Part 50, Appendix J, § III.D.2(b)(ii). The essential facts are not in dispute. Applicants seek for their Perry facility a partial but permanent exemption under 10 C.F.R. § 50.12(a) from one of the containment leakage testing requirements in Appendix J. The requirements at issue relate to testing for airlock leaks. Applicants' exception, if granted, would allow testing of the airlock seal in lieu of testing the entire airlock in cases where the airlock has been opened during periods when containment integrity is not required. (This substitute is explicitly permitted by the regulations where the opening occurs when containment integrity is required). See 10 C.F.R. Part 50, Appendix J, § III.D.2(b)(iii). The basis for the exemption requested is that the regulatory test requirement, if applied, would require either a lengthy and costly test method to be pursued, or, alternatively, a major design change, either of which would decrease plant availability and create substantial and unjustifiable operational cost increases. In Applicants' view the exemption does not present an undue risk to the public health and safety, is consistent with the common defense and security, and is in the public interest. A number of nuclear facilities have received the same exemption in the past. See Applicants' Answer at 3 and Staff Response at 8 and attachment.

The Applicants included notice of the planned exception from Appendix J in their initial (July 1984) and subsequent drafts of the Perry plant's technical specifications and supported with an analysis their exemption request to the Commission on April 8, 1985. See Applicants' Answer, Attachments 2, 3, 4 and 5 and OCRE Motion, Exhibit 1.

The Staff, pursuant to 10 C.F.R. § 51.35, has prepared an environmental assessment and finding of no significant impact of the requested exemption which suggests, at least, that the request will be approved. There is an added condition included therein that full-pressure testing required by § III.D.2(b)(ii) will have to be undertaken whenever maintenance is performed on a containment airlock.

OCRE's stated objections to the Applicants' submittal in part deals with the merits of the exemption requested and in part with the procedure being followed. All parties agree on the Commission's existing standards for reopening the record and for late-filed contentions even though there is a sharp divergence over their application.

Intervenor's proposed new contention reflects OCRE's position that Applicants should have filed for an exemption under 10 C.F.R. § 2.758 rather than § 50.12. However, OCRE also alleges a failure on Applicants' part to meet the tests required under 10 C.F.R. § 50.12 as well. This later section of the regulations provides for the Commission to grant such exemptions from the requirements of Part 50 as it determines are authorized by law and will not endanger life or property and the common defense and security and are otherwise in the public interest.

The Intervenor initially challenges the Commission's legal authority to issue exemptions from its regulations, a thrust which is beyond a licensing board's responsibility to consider. See 10 C.F.R. § 2.758(a); *Potomac Electric Power Co.* (Douglas Point Nuclear Generating Station, Units 1 and 2), ALAB-218, 8 AEC 79, 89-90 (1974). The Commission has previously expressed its view on challenges to 10 C.F.R. § 50.12. See *Carolina Power and Light Co.* (Shearon Harris Nuclear Power Plant, Units 1, 2, 3 and 4), CLI-74-9, 7 AEC 196 (1974). Intervenor next contends that Applicants' request for an exemption does not meet the standards of § 50.12, alleging its primary motive for the request is avoidance of financial hardship, a claim OCRE suggests is beyond the Commission's authority to consider. In our view, the cases cited by OCRE have no direct applicability to the issue of exemptions involved here. Continuing, OCRE alleges that the grant of an exemption would increase dangers to the public health and property and as a consequence not be in the public interest. We need not burden this Order with a detailed evaluation of these particular OCRE allegations since if Applicants have validly filed a request under 10 C.F.R. § 50.12 then the grant of the requested exemption under its present posture will be a matter for the Commission to decide.

The Commission does have pending a proposed rule designed to clarify the standards that will be applied when it considers requests for exemptions under § 50.12. See 50 Fed. Reg. 16,506 (1985). Although the

rule being proposed has no present application here, the Appeal Board has recently pointed out that the discussion in the notice yields useful insight on the application and purpose of the rule in its existing form. See *Philadelphia Electric Co.* (Limerick Generating Station, Units 1 and 2), ALAB-809, 21 NRC 1605, 1610 n.5 (1985). The rule proposes to include "financial or economic hardship" and "any unusual difficulties" as circumstances that could justify an exemption. As the Appeal Board noted, *supra*, the proposed rulemaking is intended to incorporate certain standards now being applied by the Staff as a matter of practice. The central issue before us, however, is a determination on whether Applicants' request for relief, as OCRE alleges, is required to be filed under § 2.758 rather than § 50.12 of the Commission's regulations. If the decision here is in the affirmative, we will need to evaluate whether the standards for reopening the record and filing a new contention have been met. If negative, no purpose is served by deciding the merits of that issue in this decision.

Section 2.758 is the basic regulation which insulates the Commission's rules and regulations from attack or challenges in an adjudicatory proceeding. It provides a method for waivers or exceptions to be made in the application of such rules or regulations to a particular subject matter of the proceeding wherein the application of the rule or regulation would not serve the purpose for which it was adopted. A petition for a waiver or exception is permissible and generally should be utilized where the interpretation or the application of a regulation to particular facts is questioned. See *Washington Public Power Supply System* (WPPSS Nuclear Project Nos. 3 and 5), CLI-77-11, 5 NRC 719, 723 (1977). The waiver petition must be accompanied by an affidavit that identifies the specific aspects of the subject matter of the proceeding as to which application of the rule would not serve the purpose for which the rule or regulation was adopted. If a licensing board finds a *prima facie* showing has been made, the waiver petition is then certified to the Commission for its final disposition. Petitions for waivers or exceptions should be granted only in "unusual and compelling circumstances." *Northern States Power Co.* (Monticello Nuclear Generating Plant, Unit 1), CLI-72-81, 5 AEC 25, 26 (1972). The Applicants here make no claim that the regulatory testing requirement of § III.D.2(7)(ii) does not serve their purpose but rather that compliance would result in costly delays in operation. Further, it is clear that a petition for a waiver or exception under § 2.758 represents an optional procedure which may or may not be available in the circumstances of a particular proceeding.

The Intervenor, citing a Commission ruling in a *Shoreham* case, argues that absent directions from the Commission in this case, since

the Applicants are a party in an adjudicatory proceeding, they *must* submit their exemption request as a petition under § 2.758 to the Licensing Board (emphasis added). See *Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), CLI-84-8, 19 NRC 1154 (1984). The *Shoreham* case, as we see it, however, is not applicable since it involved an exemption request under § 50.12 and that exemption was directly related to a contention being litigated in the proceeding. No similar relationship exists in the Perry proceeding. The Board is commanded by 10 C.F.R. § 2.760(a) to adjudicate only such matters as are placed in controversy by the parties. It can raise issues on its own initiative which involve serious safety, environmental, or common defense and security matters; however, the exemption Applicants seek here does not raise that matter to a level of such concern here — this is particularly true in view of the number of other facilities which have received identical exemption approvals. We, of course, do not suggest that the Commission, if it desired, could not direct this Board to consider the merits of Applicants' pending § 50.12 request. It has done so in the past. See *Carolina Power and Light Co.* (Shearon Harris Nuclear Power Plant, Units 1, 2, 3 and 4), CLI-74-9, 7 AEC 197, 198 (1974). Inasmuch as OCRE forwarded its communication in opposition to the Applicants' exception request to the NRC Project Manager of the Perry facility on May 8, 1985 — the substance of which is identical to arguments made in the present motion — the Commission and Staff have OCRE's views on the issue before it for any evaluation they believe may be required.

The Board concludes that no obligation rests on the Applicants to file their exemption request as a petition under § 2.758, that the relief it seeks is not available from that section, and that the Intervenor's

motion to open up the record to consider a contention in this area flounders for lack of any foundation. We conclude, therefore, its motion must be dismissed.

ORDERED

THE ATOMIC SAFETY AND
LICENSING BOARD

James P. Gleason, Chairman
ADMINISTRATIVE JUDGE

Glenn O. Bright
ADMINISTRATIVE JUDGE

Jerry R. Kline
ADMINISTRATIVE JUDGE

Bethesda, Maryland

Directors'
Decisions
Under
10 CFR 2.206

DIRECTORS' DECISIONS

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

Harold R. Denton, Director

In the Matter of

Docket No. 50-528
(10 C.F.R. § 2.206)

ARIZONA PUBLIC SERVICE
COMPANY, *et al.*
(Palo Verde Nuclear Generating
Station, Unit 1)

August 9, 1985

The Director of the Office of Nuclear Reactor Regulation denies the petition of Mr. Myron L. Scott of the Coalition for Responsible Energy Education which requested delay in the issuance of the PVNGS Unit 1 license until certain concerns were resolved. The Petitioner contended that the incentive regulations adopted by the Arizona Corporation Commission and the fuel load bonus plan adopted by the Licensees had not been adequately reviewed for their potential safety impact and that emergency preparedness of State and local agencies for PVNGS was inadequate due to underfunding.

DIRECTOR'S DECISION UNDER 10 C.F.R. § 2.206

INTRODUCTION

By petition dated December 18, 1984, Myron L. Scott, on behalf of the Coalition for Responsible Energy Education (CREE), raised three concerns about the Palo Verde Nuclear Generating Station (PVNGS) Unit 1 and requested that no license be issued for PVNGS Unit 1 until the concerns are resolved. Specifically, the Petitioner contends that:

- (1) Incentive regulations imposed by the Arizona Corporation Commission (ACC) on the Arizona Public Service Company (APS) have not been adequately reviewed for their potential safety impact on PVNGS Unit 1;
- (2) The fuel load bonus plan put into effect in the Summer of 1984 by APS compromises safe testing and startup of PVNGS Unit 1, and should be reviewed and/or have special inspections conducted to guarantee that no adverse safety implications have occurred or will occur; and
- (3) Emergency preparedness of State and local agencies for PVNGS is inadequate since the agencies may be underfunded.

The petition was referred to the Staff for appropriate action in accordance with 10 C.F.R. § 2.206. By letter dated February 11, 1985, I informed the Petitioner that the relief requested prior to issuance of the low-power license was not required (and, hence, was denied for that licensing action). Notice that the petition was under consideration was published in the *Federal Register*, 50 Fed. Reg. 7152 (Feb. 20, 1985). The Staff has completed its evaluation of the petition and, for the reasons stated in this Decision, has determined that the Petitioner's concerns could be and were reviewed and satisfactorily resolved prior to issuance of the full-power license for PVNGS Unit 1 without the need for issuance of an order to show cause to the Licensees.

DISCUSSION

Petitioner's Concerns with Regard to the ACC Incentive Plan and APS Fuel Load Bonus Plan

Petitioner states that on November 28, 1984, ACC adopted an incentive regulation package for PVNGS which includes a delay penalty dependent upon PVNGS Unit 1 commercial operation, a total project construction cost ceiling, and an operating efficiency performance incentive for PVNGS Unit 1. Petitioner contends that these incentives have not been adequately reviewed for their potential safety impact on PVNGS.

Petitioner also states that an APS bonus plan was put in effect in the Summer of 1984 for certain personnel relating to the fuel load date for PVNGS Unit 1. In this regard, Petitioner contends that the plan compromises safe testing and startup and should be reviewed and/or have special inspections conducted to guarantee that no adverse safety implications have or will occur.

The Staff considered the above issues prior to issuing a low-power license for PVNGS Unit 1. As stated in my letter to the Petitioner on February 11, 1985, I did not believe that the immediate relief requested (i.e., no license should be issued until the issues were resolved) was required since there was adequate assurance of public health and safety. Construction of PVNGS Unit 1 was essentially complete prior to the time the incentive programs were put into effect. Before issuance of the low-power license, the Staff had determined through a number of inspections that construction and testing of the plant had been completed in substantial agreement with APS's docketed commitments and regulatory requirements.

Prior to issuance of the full-power license for PVNGS Unit 1, the Staff did review in detail the ACC incentive regulations and the fuel load bonus plan established by APS. The Staff provided its views on incentive plans to the ACC in my letter to Wayne Ruhter dated April 9, 1985. The safety concern associated with incentive plans is that in response to short-term economic pressures, licensees may hurry work, take shortcuts or delay action in order to meet a deadline, a cost limitation or other factor. Such actions could have adverse effects on plant safety. In other words, the potential exists that such a program could unintentionally encourage the adoption of actions designed to maximize the measured performance against which the financial rewards or penalties of the incentive plan are applied, but which could adversely affect the public health and safety.

The Staff performed an evaluation of the financial aspects of the ACC incentive plan and determined that none of the elements are likely to have a significant effect on APS's overall financial condition or well being. In addition, two of the elements, i.e., those relating to achievement of commercial operation and the construction cost ceiling, are not likely to be "triggered" since those goals should be completed before the incentives come into effect. Also, since the incentives are relatively modest and are all graduated with no step changes in the amount of incentives involved, the Staff has not found any adverse safety implications.

The APS fuel load bonus plan objective was achieved when the first fuel element was loaded on January 7, 1985. Bonuses were granted based on that date and the bonus plan ended before initial criticality and before low-power testing began. To assure that the fuel load bonus plan did not result in any compromise of plant quality, the Staff conducted an enhanced inspection effort at PVNGS Unit 1 for the period prior to, and including, initial criticality and the low-power testing phase.

As a result of the enhanced inspection effort, the Staff has found no negative impact to date from either the APS fuel load bonus plan or the ACC incentive plan. The Staff will continue to monitor the performance of the plant as part of its normal inspection program.

Therefore, as discussed above, Petitioner's concerns relative to incentive plans have been reviewed and were satisfactorily resolved prior to issuance of the full-power license for PVNGS Unit 1.

Petitioner's Concern with Regard to Offsite Emergency Preparedness

Petitioner contends that emergency preparedness of State and local agencies is inadequate since the agencies may be underfunded and that no license should be issued to PVNGS Unit 1 until this issue is resolved. In support of its contention, Petitioner provided a report by the Auditor General of the State of Arizona, dated November 8, 1984.

The Staff had considered the above concern prior to issuing a low-power license for PVNGS Unit 1. Because of the following considerations, I did not believe that the immediate relief requested was required. The Staff's review had determined that the status of emergency preparedness for PVNGS was acceptable for issuance of a low-power license. Specifically, APS's onsite emergency plan was found adequate and the results of the emergency exercise in September 1984 established that the plan was being properly implemented. The September 1984 exercise also involved a demonstration of offsite preparedness, and the Federal Emergency Management Agency (FEMA) determined that there is reasonable assurance that appropriate protective measures can be implemented by offsite jurisdiction with regard to the offsite, State and local plans.

Prior to issuance of the full-power license for PVNGS Unit 1, the Staff did review the information provided by the Petitioner. During the time between low-power and full-power licensing, FEMA completed its review of offsite, State and local plans and found the plans to be adequate. FEMA also reviewed the November 8, 1984 report by the Auditor General of the State of Arizona as discussed in a memorandum from Richard Krimm to Edward L. Jordan, dated May 16, 1985. The gist of the Auditor's finding was that the Arizona Radiation Regulatory Agency (ARRA), which has certain emergency response and environmental surveillance responsibilities for PVNGS, was not adequately keeping track of its expenses related to PVNGS and thus, was not asking for sufficient funds from the Nuclear Emergency Management Fund which is the legislatively mandated source of payment for these expenses. Instead,

ARRA was using General Funds to pay for many of its PVNGS costs. Thus, the report was not identifying a concern with the overall level of funding available to ARRA for its emergency planning responsibilities, but that the funds were not being derived from the appropriate source, i.e., an annual assessment levied against the owners of PVNGS. FEMA has determined that the funding issues involving emergency response organizations are not relevant to, and do not alter, the FEMA finding regarding the adequacy of offsite emergency preparedness.

Petitioner's concerns were reviewed and satisfactorily resolved prior to issuance of the full-power license for PVNGS Unit 1. No further action is required.

CONCLUSION

As explained above, no adequate basis existed for not issuing a low-power license for PVNGS Unit 1. Accordingly, the Petitioner's request had been denied for that licensing action. The Petitioner's concerns were reviewed and satisfactorily resolved prior to issuance of the full-power license for PVNGS Unit 1. No further action is required. A copy of this Decision will be filed with the Secretary for the Commission's review in accordance with 10 C.F.R. § 2.206(c) of the Commission's regulations.

Darrell G. Eisenhut, Acting
Director
Office of Nuclear Reactor
Regulation

Dated at Bethesda, Maryland,
this 9th day of August 1985.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

James M. Taylor, Director

In the Matter of

Docket No. 50-341
(10 C.F.R. § 2.206)

THE DETROIT EDISON COMPANY,
et al.
(Enrico Fermi Atomic Power
Plant, Unit 2)

August 12, 1985

The Director of the Office of Inspection and Enforcement denies the petition of Mr. Stanley Nietubicz requesting legal action to rectify an asserted lack of viable evacuation routes under flood conditions for certain areas around the Fermi 2 facility.

DIRECTOR'S DECISION UNDER 10 C.F.R. § 2.206

INTRODUCTION

By letter dated April 15, 1985, Stanley Nietubicz requested that the Nuclear Regulatory Commission (NRC) institute legal action to rectify the lack of viable evacuation routes under flood conditions for certain areas near the Fermi-2 facility. It was determined that the request would be treated under 10 C.F.R. § 2.206 of the Commission's regulations.

Notice of the NRC's intent to treat Mr. Nietubicz's request as a petition under § 2.206 of the Commission's regulations was published in the *Federal Register* on June 11, 1985 (50 Fed. Reg. 24,602). Because of the division of responsibilities for the evaluation of emergency preparedness

for nuclear power plants,¹ the NRC requested the assistance of the Federal Emergency Management Agency (FEMA) in responding to Mr. Nietubicz's concern. In addition to the response from FEMA dated June 27, 1985, Detroit Edison Company (Licensee) submitted comments on the issue in Mr. Nietubicz's petition by letter dated June 26, 1985.

DISCUSSION

Mr. Nietubicz's concern involves evacuation routes in the environs of Fermi-2. He contends that in the event an accident should occur at Fermi-2 requiring evacuation during a flood situation, there would be no viable evacuation route for the residents of Estral Beach and Stoney Point. Mr. Nietubicz states that the Estral Beach/Stoney Point area is fronted by a shallow basin of Lake Erie. The area is subject to periodic flooding under certain wind conditions that renders existing roads impassable. Mr. Nietubicz contends that under such conditions there would be no evacuation routes leading from the Estral Beach/Stoney Point area.

In its June 26, 1985 response to Mr. Nietubicz's concern, Detroit Edison Company stated that flooding along the Lake Erie shoreline in the vicinity of Estral Beach is primarily a wind-induced phenomenon. An analysis of severe storms in the area showed that these storms and associated flooding were always accompanied by either northeast or east winds. Comparing the location of Estral Beach with the Fermi-2 reactor site shows that any release from Fermi-2 under such wind conditions would *not* be in the direction of Estral Beach; in fact, the wind would be directed away from the beach.

The Licensee stated that flooding of this nature is not an instantaneous phenomenon. These flood-producing winds are generally in the range of 30-45 miles per hour and sustained for 18-24 hours. As such, there is time for advance warning from either the National Oceanographic and Atmospheric Agency (NOAA) or the Emergency Broadcast System (EBS). Should an incident occur at Fermi-2 during a storm where local flooding had occurred, persons who had not already evacuated because of the flooding could be moved with heavy vehicles from the Road Commission (if an evacuation were considered to be the most appropriate protective action).

¹ FEMA, by Presidential directive, has been assigned the responsibility for assessing the adequacy of off-site emergency plans for the area surrounding a nuclear plant. The NRC is responsible for assessing the adequacy of onsite emergency plans and has the final licensing authority.

In addition, information provided by the Licensee indicates that these flooding conditions would not impact any of the paved, secondary routes which would be the primary routes used for evacuation. The Village of Estral Beach and Frenchtown Township are in the process of preparing to construct alternate secondary routes out of Estral Beach and Stoney Point, respectively. The Detroit Edison Company has agreed to participate in sharing the costs of these projects, and work on the Estral Beach evacuation route has already begun.

FEMA has evaluated the adequacy of offsite preparedness for Fermi-2 with respect to the flooding issue raised by Mr. Nietubicz. FEMA also has verified the Licensee's agreement with Estral Beach to help with upgrading their evacuation route to provide protection from floodwaters.

FEMA has forwarded the State of Michigan Emergency Management Division's response to Mr. Nietubicz in which the State noted that any threat to the existing evacuation routes by flooding also would be a threat to the entire area because the roads and the area are on the same floodplain. Under such conditions, the State indicated that it would seem likely that the community would evacuate early because of flooding as opposed to an accident at Fermi-2.

On the basis of the above information, FEMA continues to believe that State and local plans and preparedness are adequate and that there is reasonable assurance that the health and safety of the public can be protected in the event of a radiological emergency at Fermi-2.

CONCLUSION

In summary, on the basis of the above information, the NRC supports the FEMA conclusion and concludes that there is reasonable assurance that the Fermi-2 facility meets the applicable regulatory requirements and guidance of the NRC and FEMA for emergency preparedness. With respect to Mr. Nietubicz's specific emergency planning concern regarding evacuation routes raised in the petition to the NRC, the findings described above support the conclusion that his concern has been satisfactorily resolved and is adequately addressed in the emergency plans for the Fermi-2 facility. I, therefore, conclude that no further action is required to resolve Mr. Nietubicz's concern.

A copy of this Decision will be filed with the Secretary of the Commission for review by the Commission in accordance with § 2.206. As provided therein, this Decision will constitute final action of the Commission twenty-five (25) days after the date of issuance, unless the Com-

mission, on its own motion, institutes a review of this Decision within that time.

James M. Taylor, Director
Office of Inspection and
Enforcement

Dated at Bethesda, Maryland,
this 12th day of August 1985.