

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

82 MAY 12 10:53

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of)
METROPOLITAN EDISON COMPANY)
(Three Mile Island Nuclear)
Station, Unit No. 1))

Docket No. 50-289
(Restart)



LICENSEE'S BRIEF IN OPPOSITION TO THE
EXCEPTIONS OF OTHER PARTIES TO THE ATOMIC
SAFETY AND LICENSING BOARD'S PARTIAL INITIAL
DECISION ON PLANT DESIGN AND PROCEDURES,
SEPARATION, AND EMERGENCY PLANNING ISSUES

SHAW, PITTMAN, POTTS & TROWBRIDGE

George F. Trowbridge, P.C.
Thomas A. Baxter, P.C.
Robert E. Zahler
Delissa A. Ridgway

Counsel for Licensee

May 10, 1982

D503
s/
1/1

8205140414 820510
PDR ADOCK 05000289
G PDR

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

LICENSEE'S BRIEF IN OPPOSITION TO THE
EXCEPTIONS OF OTHER PARTIES TO THE ATOMIC
SAFETY AND LICENSING BOARD'S PARTIAL INITIAL
DECISION ON PLANT DESIGN AND PROCEDURES,
SEPARATION, AND EMERGENCY PLANNING ISSUES

SHAW, PITTMAN, POTTS & TROWBRIDGE

George F. Trowbridge, P.C.
Thomas A. Baxter, P.C.
Robert E. Zahler
Delissa A. Ridgway

Counsel for Licensee

May 10, 1982

TABLE OF CONTENTS

	<u>Page(s)</u>
TABLE OF AUTHORITIES.....	iii
I. INTRODUCTION.....	1
II. EXCEPTIONS OF THE UNION OF CONCERNED SCIENTISTS.....	2
A. Introduction.....	2
1. Failure to Brief Certain Exceptions.....	3
2. Extent of Argument and Record Citations in Support of Briefed UCS Exceptions.....	4
3. Licensing Board Confrontation of the Evidence and Arguments Advanced by UCS.....	7
4. General Arguments.....	9
B. Systems Classification and Interaction (Exceptions 65, 66, 68-71, 73-79, 82-84).....	13
C. Pressurizer Heaters (Exceptions 16-23).....	28
D. Connection of Pressurizer Heaters to Diesels (Exceptions 24-30).....	37
E. Valves (Exceptions 31, 33-45).....	44
F. Natural and Forced Circulation (Exceptions 1-15).....	50

G.	Emergency Feedwater Reliability (Exceptions 103, 104, 107-109).....	68
H.	Safety System Bypass and Override (Exceptions 46-56).....	86
I.	Equipment Qualification (Exceptions 57-64).....	98
J.	The "Necessity" Standard (Exception 110).....	105
K.	Delegations and Conditions (Exceptions 111-116).....	116
L.	Unresolved Generic Safety Issues (Exception 117).....	119
M.	NEPA and Class 9 Accidents (Exception 120 [or 118]).....	120
III.	EXCEPTIONS OF THE COMMONWEALTH OF PENNSYLVANIA.....	124
IV.	EXCEPTIONS OF THE AAMODTS.....	133
A.	Information Transmittal and Public Education (Exceptions 1-14).....	134
B.	Emergency Plans for Farmers (Exceptions 15-51).....	140
C.	Ingestion Exposure Pathway (Exceptions 52-56).....	150
V.	CONCLUSION.....	155

TABLE OF AUTHORITIES

Page(s)

Cases:

<u>Columbia Transportation Co. v. U.S.</u> , 167 F. Supp. 5 (E.D. Mich. 1958).....	7,8
<u>Consumers Power Company</u> (Midland Plant, Units 1 and 2), ALAB-282, 2 N.R.C. 9, 10 (1975).....	69
<u>Duke Power Company</u> (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 N.R.C. 397, 413 (1976).....	6
<u>Duke Power Company</u> (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 N.R.C. ____ (March 30, 1982).....	35,94
<u>Florida Power and Light Company</u> (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB-603, 12 N.R.C. 30 (1980), clarified by CLI-81-12, 13 N.R.C. 838 (1981).....	71,76
<u>Gulf States Utilities Co.</u> (River Bend Station, Units 1 and 2), ALAB-444, 6 N.R.C. 760, 772 (1977).....	120
<u>In the Matter of Petition Requesting Seismic Reanalysis</u> , DD-80-1, 11 N.R.C. 153, 165-66 (1980).....	113,114
<u>Metropolitan Edison Company, et al.</u> (Three Mile Island Nuclear Station, Unit No. 1) Commission "Order and Notice of Hearing," CLI-79-8, 10 N.R.C. 141 (1979).....	10,99,116
Licensing Board "First Special Prehearing Conference Order," LBP-79-34, 10 N.R.C. 828 (1979).....	50,99,120
Licensing Board "Partial Initial Decision, Pro- cedural Background and Management Issues," LBP-81-32, 14 N.R.C. 381 (1981). 50,54,99,123	
Licensing Board "Memorandum and Order on NEPA-Compliance Issues," (December 15, 1981).....	121-124

Licensing Board "Memorandum and Order Modifying Partial Initial Decision of December 14, 1981," LBP-82-____, 15 N.R.C. ____ (January 26, 1982).....	11,53
Licensing Board "Memorandum and Order Setting Preliminary Hearing" (March 2, 1982).....	93
Licensing Board "Memorandum and Order Modifying and Approving NRC Staff's Plan of Implementation," (April 5, 1982).....	26,27,117-119
Licensing Board "Memorandum and Order Denying Motion to Reopen Record" (April 26, 1982).....	94
<u>Nader v. Nuclear Regulatory Commission</u> , 513 F.2d 1045, 1052 (D.C. Cir. 1975).....	115
<u>Nader v. Ray</u> , 363 F. Supp. 946, 954 (D.D.C. 1973).....	114,115
<u>Northern States Power Company</u> (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-104, 6 A.E.C. 179 (1973).....	8
<u>Pacific Gas and Electric Company</u> (Diablo Canyon Nuclear Power Plant, Unit No. 2), ALAB-254, 8 A.E.C. 1184, 1190 (1975).....	66
<u>Petition for Emergency and Remedial Action</u> , CLI-80-21, 11 N.R.C. 707 (1980).....	100
<u>Public Service Company of Indiana, Inc.</u> (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-461, 7 N.R.C. 313, 315 (1978).....	4
<u>Public Service Company of New Hampshire</u> (Seabrook Station, Units 1 and 2), ALAB-422, 6 N.R.C. 33, 41 (1977), <u>aff'd.</u> , CLI-78-1, 7 N.R.C. 1 (1978).....	8,9,70
<u>Public Service Company of Oklahoma, et al.</u> (Black Fox Station, Units 1 and 2), ALAB-573, 10 N.R.C. 775, 789 (1979).....	69

<u>Public Service Electric and Gas Company, et al.</u> (Hope Creek Generating Station, Units 1 and 2), ALAB-394, 5 N.R.C. 769, 770 (1977).....	5
<u>Public Service Electric and Gas Company, et al.</u> (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 N.R.C. 43 (1981).....	4,5,35
<u>Raye and Co. Transports, Inc. v. U.S.</u> , 314 F. Supp. 1036 (W.D. Mo. 1970).....	8,9
<u>Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-409, 5 N.R.C. 1391, 1395 (1977).....</u>	4
<u>Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-463, 7 N.R.C. 341, 370 (1978).....</u>	5
<u>Toledo Edison Company, et al. (Davis-Besse Nuclear Power Station), ALAB-157, 6 A.E.C. 858 (1973).....</u>	69
 <u>Regulations:</u>	
10 C.F.R. § 2.715(c).....	124
10 C.F.R. § 2.754(c).....	6
10 C.F.R. § 2.762(a).....	5
10 C.F.R. § 2.762(b).....	5
10 C.F.R. § 50.2(u).....	10
10 C.F.R. § 50.47(b)(11).....	131
10 C.F.R. § 50.54(s)(2)(ii).....	125
10 C.F.R. § 50.54(s)(3).....	129
10 C.F.R. § 50.55a(h).....	89
10 C.F.R. § 50.109.....	113
10 C.F.R. § 50.109(a).....	111
10 C.F.R. Part 50, Appendix A.....	14,20,32

10 C.F.R. Part 100.....	29
-------------------------	----

Miscellaneous

45 Fed.Reg. 40101 (1980), Interim Statement of Policy, Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969.....	122
46 Fed.Reg. 58484 (1981), Interim Requirements Related to Hydrogen Control.....	67
47 Fed.Reg. 2876 (January 20, 1982) Proposed Rules on Environmental Qualification of Electrical Equipment for Nuclear Power Plants.....	101
47 Fed.Reg. 7023 (February 17, 1982), Proposed Policy Statement on Safety Goals for Nuclear Power Plants..	71,75

May 10, 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

LICENSEE'S BRIEF IN OPPOSITION TO THE
EXCEPTIONS OF OTHER PARTIES TO THE ATOMIC
SAFETY AND LICENSING BOARD'S PARTIAL INITIAL
DECISION ON PLANT DESIGN AND PROCEDURES,
SEPARATION, AND EMERGENCY PLANNING ISSUES

I. INTRODUCTION

On December 14, 1981, the Atomic Safety and Licensing Board in this proceeding ("the Licensing Board") issued a Partial Initial Decision on Plant Design and Procedures, Separation, and Emergency Planning Issues. Exceptions to that decision were filed with the Atomic Safety and Licensing Appeal Board by Licensee, the Commonwealth of Pennsylvania, and intervenors Union of Concerned Scientists ("UCS") and the Aamodts.

Pursuant to the direction of the Appeal Board in its Order of March 24, 1982, Licensee herein submits a single,

consolidated brief in response to the briefs filed in support of the exceptions of the other parties. Licensee's reply is in opposition to all of the exceptions of the other parties. The reply is organized into three major parts, by appellant. The UCS exceptions address the Licensing Board's decision on plant design and procedures issues, while the exceptions of the Commonwealth and the Aamodts go to emergency planning issues exclusively.

II. EXCEPTIONS OF THE UNION OF CONCERNED SCIENTISTS

A. Introduction

Seven contentions were actually brought to trial by UCS.^{1/} On February 8, 1982, UCS filed 120 exceptions to the Licensing Board's decision on those contentions, and on several Licensing Board questions which were tried as plant design and procedures issues.

The "Union of Concerned Scientists' Brief on Exceptions to the Partial Initial Decision of December 14, 1981" (hereinafter "UCS Brief") is arranged not by exception, but into nine sections -- six of which address the Licensing Board's decision on UCS contentions, two of which address Licensing Board questions, and one labeled "Other Errors of Law." The organization of Licensee's reply brief may best be viewed from the Table of

^{1/} Those are Contentions 1, 2, 3, 4, 5, 10 and 14. Others were converted into Licensing Board questions when UCS withdrew them (contentions 6, 8, 9, 12, 13), and the fundamental issues raised in the contentions were decided by that Board.

Contents, which includes section titles employed in the Licensing Board's decision. UCS did not brief its exceptions in numerical order. Licensee, in addition, does not find merit in the order of argument followed in the UCS brief. Rather, we have attempted to place the technical issues raised by the UCS appeal into a more logical decision-making sequence.

Prior to embarking upon Licensee's detailed reply to the UCS Brief, however, there are certain generic responsive arguments to be made at the outset.

1. Failure to Brief Certain Exceptions

While UCS has not called attention to any withdrawal of exceptions, Licensee's comparison of the UCS Brief with the exceptions filed on February 8, 1982, reveals that the following 27 exceptions were omitted from the UCS Brief:

Exception 32 (grouped under UCS Contention 5);

Exceptions 67, 72, 80, 81 and 85 (grouped under UCS Contention 14);

Exceptions 86 through 102 (all of the exceptions under the heading "Board Question/UCS Contention 13 and Board Question 2");

Exceptions 105 and 106 (grouped under Board Question 6); and

Exceptions 118 and 119 (grouped under "Other Errors of Law")^{2/}

^{2/} As we pointed out in "Licensee's Answer to the UCS Motions for Extensions of Time to File Briefs and for Waiver of Page Limitation," March 22, 1982, UCS has briefed the original

(Continued next page)

Appeal Boards often have held that unbriefed exceptions should be disregarded as waived. See, e.g., Public Service Electric and Gas Company, et al. (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 N.R.C. 43, 49-50 (1981); Public Service Company of Indiana, Inc. (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-461, 7 N.R.C. 313, 315 (1978); and cases cited therein. Licensee therefore proposes that the Appeal Board dismiss the above-listed UCS exceptions.^{3/}

2. Extent of Argument and Record Citations
in Support of Briefed UCS Exceptions

Few of the UCS exceptions (to be precise, 18 of the 93 briefed) are the subject of separate supporting argument in the UCS Brief. Most have been grouped for support by a single argument section of the brief, and there is considerable reliance placed upon extensive portions of the proposed and reply findings UCS filed with the Licensing Board.^{4/} Many of the exceptions

(Continued)

Exception No. 120 as No. 118. The original Exceptions 118 and 119, however, are not addressed in the UCS Brief.

3/ In any case, Licensee has followed the Appeal Board's advice in Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-409, 5 N.R.C. 1391, 1395 (1977), that the obligation to respond to an appeal arises only upon the filing and service of appellant's brief. We have not attempted to reply to the unbriefed UCS exceptions.

4/ See, e.g., UCS Brief at 41, 48 (Exception 45), 66, 70, 74 (Exception 52), 77 and 91.

overlap and, though they appear under different headings in the UCS Brief, seem to be repetitive.^{5/}

Licensee questions whether the UCS Brief conforms to the Commission's Rules of Practice which, at 10 C.F.R. § 2.762(a), require that the appellant's brief, ". . . with respect to each exception, shall specify, inter alia, the precise portion of the record relied upon in support of the assertion of error." [Emphasis supplied.] See also 10 C.F.R. § 2.762(b). Because exceptions have been grouped for briefing, neither the appellees nor the Appeal Board can ascertain with any degree of precision which UCS arguments are intended to support which particular UCS exception. Similarly, by citing to proposed and reply findings, in many instances UCS has not placed the appellees and the Appeal Board on notice of "the precise portion of the record relied upon in support of the assertion of error."^{6/}

^{5/} See, e.g., UCS Brief at 21 (beginning of argument on Exceptions 18 and 19: "Exception 19 essentially duplicates Exception 11. The substance of Exception 18 was also discussed supra."), 23 (argument on Exception 31, rather than where the exception appears, at 42), 35 (argument on Exceptions 26, 27 and 29 "fully discussed" in connection with Exceptions 24, 25 and 28), 44 (argument on Exceptions 39 and 40), and 106 (argument on Exception 107 incorporates by reference argument on Exceptions 9-11, 16-19).

^{6/} The Appeal Board has admonished appellants in the past not to rely upon proposed findings in place of meaningful argument and record references. See Salem, supra, ALAB-650, 14 N.R.C. at 50 (1981); Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-463, 7 N.R.C. 341, 370 (1978); Public Service Electric and Gas Company, et al. (Hope Creek Generating Station, Units 1 and 2), ALAB-394, 5 N.R.C. 769, 770 (1977).

This is particularly troublesome in view of the fact, pointed out in Licensee's replies below, that so many of the UCS proposed findings themselves include no citation to the evidentiary record, as required by 10 C.F.R. § 2.754(c).

It is, of course, up to the Appeal Board to police practice before it and, in particular, compliance with applicable Commission regulations. As an appellee here whose interests are strong in presenting a complete response to the UCS appeal, Licensee must record that, because of the factors noted above, its reply is directed to the argument actually contained in the UCS Brief, and not to the exceptions themselves or unstated arguments made below before the Licensing Board. Further, Licensee believes that by citing to proposed findings and not to the evidentiary record in support of assertions of error, UCS has assumed the risk that the intended record support for its arguments may not be confronted by the Appeal Board in its rulings on the UCS exceptions. It is the appellant's obligation to submit a brief containing sufficient information and argument to allow the appellate tribunal to make an intelligent disposition of the issues raised by the exceptions. See Duke Power Company (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 N.R.C. 397, 413 (1976).

3. Licensing Board Confrontation of the
Evidence and Arguments Advanced by UCS

In the UCS exceptions and supporting argument in the UCS Brief, the Partial Initial Decision frequently is attacked for alleged failures to address evidence presented and positions taken by UCS.^{7/} While Licensee will address these complaints in its point-by-point reply below to the UCS Brief, it is appropriate to set forth in one place Licensee's position on the matter and the applicable law.

The Licensing Board's discussion, in the Partial Initial Decision, of each issue on which UCS participated is replete with references to and discussion of UCS's evidence, arguments and proposed findings. The UCS complaint widely misses the mark of what the law requires. In Columbia Transportation Co. v. U.S., 167 F.Supp. 5 (E.D. Mich. 1958), a three-judge court disposed of a similar challenge to an administrative agency's decision:

Plaintiffs assert that the Commission's order ignored evidence offered by them, and recite evidence which they claim the Commission ignored. The fact that the Commission did not in its report discuss various portions of testimony offered by plaintiffs, and give its reasons why it did not accept such evidence as controlling its decision does not, in our opinion, constitute ignoring that evidence. Inasmuch as the Commission's report contained

^{7/} See, e.g., UCS Brief at 3-4, 7-8, 11, 18-19, 23, 26, 42, 44-45, 47-48, 66, 68-70, 91, 94, 97 and 99.

3. Licensing Board Confrontation of the
Evidence and Arguments Advanced by UCS

In the UCS exceptions and supporting argument in the UCS Brief, the Partial Initial Decision frequently is attacked for alleged failures to address evidence presented and positions taken by UCS.^{7/} While Licensee will address these complaints in its point-by-point reply below to the UCS Brief, it is appropriate to set forth in one place Licensee's position on the matter and the applicable law.

The Licensing Board's discussion, in the Partial Initial Decision, of each issue on which UCS participated is replete with references to and discussion of UCS's evidence, arguments and proposed findings. The UCS complaint widely misses the mark of what the law requires. In Columbia Transportation Co. v. U.S., 167 F.Supp. 5 (E.D. Mich. 1958), a three-judge court disposed of a similar challenge to an administrative agency's decision:

Plaintiffs assert that the Commission's order ignored evidence offered by them, and recite evidence which they claim the Commission ignored. The fact that the Commission did not in its report discuss various portions of testimony offered by plaintiffs, and give its reasons why it did not accept such evidence as controlling its decision does not, in our opinion, constitute ignoring that evidence. Inasmuch as the Commission's report contained

^{7/} See, e.g., UCS Brief at 3-4, 7-8, 11, 18-19, 23, 26, 42, 44-45, 47-48, 66, 68-70, 91, 94, 97 and 99.

ultimate facts which it found from the record, it cannot be said that the Commission ignored any evidence that was before it. Failure to give to evidence the weight claimed for it by a party does not amount to ignoring such evidence.

167 F.Supp. at 15.

UCS is predictably disappointed that the Licensing Board has not rested its decision on UCS's evidence and found for UCS. Nevertheless, a careful examination of the record and comparison of it with the Licensing Board's decision reveals no misstatement or distortion of the UCS evidence. The Licensing Board's findings on the UCS positions were "supported by substantial evidence and were not required to be cast in the language of the witnesses" (or in the language of the findings proposed by the parties). See generally Raye and Co. Transports, Inc. v. U.S., 314 F.Supp. 1036, 1043 (W.D. Mo. 1970).

Thus, a licensing board has a duty not only to resolve contested issues but "to articulate in reasonable detail the basis" for the course of action chosen. Northern States Power Company (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-104, 6 A.E.C. 179 (1973). Nevertheless, as the Appeal Board acknowledged in Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), ALAB-422, 6 N.R.C. 33, 41 (1977), a licensing board's obligation in this regard has limits:

We have previously held that a decision need not refer individually to every proposed finding; it "meets the requirements of the Administrative Procedure Act and the

Commission's Rules of Practice if it sufficiently informs a party of the disposition of its contentions." [citations omitted].

See also Raye and Co. Transports, Inc. v. U.S., supra, 314

F.Supp. at 1042 (no duty "to make findings of fact upon all items of evidence submitted, nor even necessarily to answer each and every contention raised by the contestants to the hearing, but merely to make such findings which are sufficient to resolve the material issues"). Clearly, the Licensing Board's decision meets these standards.

4. General Arguments

Prior to addressing the UCS Brief in detail, there are several additional points Licensee wishes to raise in response to the UCS appeal, but which have no special place below in response to any single UCS argument.

The first such point is the unchallenged fact that not one of the UCS contentions is unique to TMI-1. Each UCS contention calls for additional plant modifications, beyond those recommended by the Director of Nuclear Reactor Regulation, which are equally applicable to other operating reactors and which have not been required for those reactors. See, e.g., Tr. 6470-73, 8125, 8229-31, 9050 (Pollard). That these contentions are generic does not decide the matter, and Licensee has not contended otherwise. Cf. I.D., ¶ 1135. The UCS case should be

recognized, however, for what it is -- a generic assault, in an individual license proceeding, on the NRC's regulation of plant design, both before and after the TMI-2 accident. If adopted for TMI-1, there is no apparent reason why the UCS proposed design modifications should not be required at other operating reactors.

Second, the design of the TMI-1 facility is not among the unique concerns for TMI-1 identified by the Commission as additional to the concerns identified for other B&W reactors. See, in this docket, CLI-79-8, 10 N.R.C. 141, 143-44 (1979).

Third, the UCS case focuses uniquely upon proposed changes to the design of hardware -- plant structures, systems, and components -- and not upon plant operating procedures and operator training. In pursuing this approach, UCS has ignored important lessons learned from the TMI-2 accident -- which go to the guidance and training provided to the operators. See, e.g., Tr. 7748, 10,683-84 (Keaten).

Fourth, UCS repeatedly takes the position that if events beyond the design basis are addressed by this agency in any way, then the event or events have been determined to be credible and the design must be modified to meet them. Licensee contends, in contrast, that the role of the design basis^{8/} in NRC regulation has not been eroded for design purposes simply because

^{8/} See 10 C.F.R. § 50.2(u) for the definition of "design bases."

events beyond the specified design basis have been addressed in operating procedures and in operator training.

In this regard, it is instructive to note some of the aspects of the Licensing Board's decision which UCS does not challenge on appeal. We have already observed that UCS failed to brief its exceptions on Board Question/UCS Contention 13 and Board Question 2. In its decision (section II.S, "Accident Design Bases"), the Licensing Board found that the Staff has demonstrated that its methods for determining which accident sequences are credible for the purposes of determining the plant's design basis are reasonable, and that the Staff's method of determining that all of the necessary TMI-2 accident-related recommendations have been identified is sufficient to provide reasonable assurance that TMI-1 can be operated in the short and long term without endangering the health and safety of the public. I.D., ¶ 1138.

Further, while the TMI-2 accident was equivalent to a small-break, loss-of-coolant accident ("LOCA"), UCS has not taken exception to the Licensing Board's findings on the adequacy of Licensee's small-break LOCA analyses and the operator guidance which is based on those analyses. See generally I.D., ¶¶ 921-970 (section II.O, "Additional LOCA Analysis"), as modified by Memorandum and Order Modifying Partial Initial Decision of December 14, 1981, LBP-82-____, 15 N.R.C. ____ (January 26, 1982).

Neither has UCS appealed the Licensing Board's finding that the safety and relief valve testing program is adequate to reveal any potential design deficiencies in the safety and relief valves at TMI-1. See generally I.D., ¶¶ 1068-1083 (section II.R, "Valve Testing").

Finally, we note that UCS has no coherent licensing or design strategy which it would substitute for the NRC's. In fact, two of UCS's major licensing and design principles appear to be mutually exclusive. On the one hand, UCS argues that every system or component which can either cause or aggravate an accident, or can be called upon to mitigate an accident, should be classified as a safety system and required to meet all safety-grade design criteria. See UCS Contention 14. On the other hand, UCS argues that the avoidance of challenges to safety systems is in itself a safety function, so that the equipment needed to avoid the challenge should be made safety grade. See, e.g., Pollard, ff. Tr. 9027, at 5-12. In other words, if a piece of equipment might be called upon to mitigate an accident, then it should be made safety grade and it should not be challenged. The avoidance of such challenges, in turn, requires further design modifications to make other equipment safety grade. This circular reasoning, which would make a museum piece out of an electric generating plant, illustrates the danger of assessing the UCS arguments in isolation from one another.

B. Systems Classification and Interaction
(Exceptions 65, 66, 68-71, 73-79, 82-84)

The Licensing Board's decision on UCS Contention 14 (I.D., ¶¶ 971-1004) is the subject of the above-listed UCS exceptions. In the contention UCS challenges, as a general matter, the classification as "non-safety-related" of systems and components which UCS contends can have an adverse effect on the integrity of the core. The relief sought is that "[a]ll systems and components which can either cause or aggravate an accident or can be called upon to mitigate an accident must be identified and classified as components important to safety and required to meet all safety-grade design criteria." I.D., ¶ 971. While certain systems and components were discussed in the litigation of UCS Contention 14 as examples or illustrations of the points being made on the classification scheme, the contention itself, and the testimony presented by the parties, was not aimed at any particular system and component or the modification thereof. UCS more specifically contends elsewhere that identified components and systems should be modified to meet safety-grade design criteria. See, e.g., UCS Contentions 2 (reactor coolant pumps), 3 (pressurizer heaters), and 5 (PORV and block valve).^{9/} Because

^{9/} The substance of UCS arguments on the PORV and its block valve (Exceptions 77 and 78, UCS Brief at 99, 100) are addressed below, in section E ("Valves").

resolution of the more general Contention 14 is pivotal to these more specific contentions, Licensee proposes to address first the general issue and related exceptions.

The UCS Brief appears to raise four basic points: (1) the NRC's classification scheme is defective; (2) assuming the correctness of the scheme it has not been applied properly to TMI-1; (3) the Licensing Board should have required a systems interaction study for TMI-1; and, (4) the NRC Staff witness was unqualified.

The Licensing Board carefully considered the positions and evidence of the parties on the classification system used by the NRC Staff to categorize systems and components as "important to safety," and on the regulatory requirements which flow from the classification. See I.D., ¶¶ 974-981. Faced with UCS arguments that the NRC's past practice for classification was defective, the Licensing Board first had to resolve a serious dispute about what that practice actually has been. The Licensing Board found that Staff witness Conran's testimony described the classification system closest to that actually used by the Staff, and that it is also the system which that Board feels should be employed. I.D., ¶ 981.

The detailed attention which was given to the use of the words "important to safety," "safety grade" and others was necessary because UCS witness Pollard took the position that the Commission's own General Design Criteria ("GDC")^{10/} have not been

^{10/} Appendix A to 10 C.F.R. Part 50.

followed by the Staff, and that appropriate adherence to those criteria would dictate the design modifications sought by UCS. UCS Brief at 87, 88.

UCS relies in large part upon an unwarranted construction of a paragraph in the introduction to the General Design Criteria. UCS quotes from this paragraph -- which defines "structures, systems, and components important to safety" [emphasis added] as those "structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public" -- and then repeats the argument of UCS witness Pollard that this language "indicates . . . Commission policy has been to apply the requirements of the GDC to systems variously referred to as safety-related, safety-grade or important to safety." UCS Brief at 88. The language clearly does not so "indicate." The terms "safety-related" and "safety-grade" are not even used in the quoted paragraph.

Leaving UCS's misplaced reliance upon the introduction to the GDC, the Licensing Board found that the very first General Design Criterion introduces the concept of different quality levels for plant features with different safety roles and varying degrees of importance to safety. I.D., ¶¶ 975, 977; Conran, ff. Tr. 8372, at 4. GDC-1, which flatly contradicts the UCS thesis, is not addressed in the UCS Brief.

In support of its Exceptions 66 and 68-71, UCS argues that the Licensing Board "ignored" all of the evidence discussed at UCS Proposed Findings of Fact 509-517. UCS apparently assumes repeatedly in this appeal that when its proposed findings were not adopted they were ignored. See supra, at 7-9. UCS then proceeds to recite those proposed findings. UCS Brief at 94-97.

UCS argues that Staff witness Conran's definitions for classifying structures, systems and components can be found nowhere in AEC/NRC documents. UCS Brief at 95. The same may be said, of course, for the UCS definitions. It is acknowledged that Mr. Conran's testimony represents the first careful, written exposition of the terms used in this litigation. While the term "safety grade," for example, is widely used in the Staff's safety review process, it is not defined explicitly in the regulations and its meaning must be inferred from the language of the regulations. Conran, ff. Tr. 8372, at 4; I.D., ¶ 975.

The Staff's position, adopted by the Licensing Board, is well founded in the regulations discussed in the Initial Decision. See I.D., ¶¶ 974-976. The credibility of the Staff's position is not diminished because it had not previously been reduced to writing in such a clear and concise fashion. Cf. UCS Brief at 95. The fact is that the nuclear power plants in operation today generally have been licensed in accordance with the classification scheme described by the Staff. Tr. 8410

(Conran). In this proceeding, it was the use of the terms "non-safety-related," "nonsafety systems," "important to safety" and "safety grade" in UCS Contention 14, accompanied by the assertion that the classification "important to safety" dictates the satisfaction of all "safety-grade" design criteria, which perhaps required the Staff for the first time to document carefully its use of these terms.^{11/} See Pollard, ff. Tr. 8091, at 14-3, 14-4.

UCS renews its attack on the Staff testimony that the structures, systems and components which must be safety grade are identified and listed in Regulatory Guide 1.29 (Conran, ff. Tr. 8372, at 6), and that the Staff's classification system described by Mr. Conran had been employed in the licensing of TMI-1 (Tr. 8411 (Conran)). See UCS Brief at 95, 96.

In this argument and elsewhere, UCS reveals its inability to comprehend the fundamental concept that a system or component may have to be "safety grade" for one function, but not for another. For example, the record is clear that the PORV is and must be safety grade for its role as a part of the reactor

^{11/} UCS points out that other Staff witnesses at this hearing were directed to use Mr. Conran's definitions. UCS Brief at 95. UCS neglects to report that Staff members were instructed to use these definitions in all of their licensing and hearing work. Tr. 8318-19 (Conran). This undoubtedly is because Staff management judged that Mr. Conran's testimony accurately reflects present and past regulatory practice.

coolant pressure boundary, and that it is not safety grade for its pressure relief function.^{12/} See Tr. 8537-38 (Conran); I.D., ¶ 792. The interpretation of General Design Criterion 2 provided by the Staff witness, which makes eminent sense, is that structures, systems and components

important to safety shall be designed to withstand the effects of natural phenomena without loss of capability to perform their critical or design safety functions, meaning to the extent that a system -- structure, system, or component that belongs to the broader class, "important to safety," has a specific design safety mission; it should retain that capability to perform that safety mission in the event of these natural phenomena.

Tr. 8533-34 (Conran). Regulatory Guide 1.29 identifies those structures, systems and components that must remain functional in the event of a safe shutdown earthquake. Conran, ff. Tr. 8372, at 6; Tr. 8536 (Conran). All structures, systems and components

^{12/} The UCS Brief (at 96) thus totally misrepresents the facts and the testimony of the witness when UCS states that there is equipment listed or covered by listings in Reg. Guide 1.29 which is not safety grade for TMI-1, implying that Mr. Conran is therefore in error when he testified that his definitions had been applied in the licensing of TMI-1. UCS cites two examples: the PORV and the emergency feedwater system. In the testimony cited by UCS, Mr. Conran specifically said that while the PORV is not listed explicitly in Reg. Guide 1.29, it would be included in components that comprise the reactor coolant pressure boundary, and that it is safety grade for that purpose. Tr. 8537-38 (Conran). As to the emergency feedwater system, the Staff witness explained that while it now is listed in the Guide, that is a new position by the Staff which does not reflect requirements at the time TMI-1 was licensed. Tr. 8542 (Conran).

that are safety grade are seismically qualified, and conversely, all structures, systems and components which are required to be seismically qualified are safety-grade. Tr. 8536 (Conran). Consequently, one should not conclude, as UCS does, that the listing of equipment in Regulatory Guide 1.29 is a listing of equipment "important to safety." The Guide is precisely consistent with Mr. Conran's definitions. Tr. 8495 (Conran).

Licensee emphasizes the Licensing Board finding that the Staff's interpretation reflects the classification system which should be employed. I.D., ¶ 981. It is at best incongruous for UCS to argue here both (1) that the Staff testimony should not be endorsed because it allegedly deviates from past regulatory practice, and (2) that past regulatory practice has significant shortcomings.

One must be wary, then, when UCS criticizes the Licensing Board for a purported mischaracterization of the UCS position. See UCS Brief at 92. Presumably referring to the UCS case, the Licensing Board made the following statement endorsing the Staff's testimony: "To argue otherwise would in one aspect of the question argue against making improvements in safety which would result in a safer system, without upgrading to a fully 'safety-grade' system." I.D., ¶ 981. A more complete exposition of the UCS case, but one which is not challenged in the UCS Brief, was provided by the Licensing Board merely one paragraph earlier:

Thus, it appears to this Board that the UCS interpretation of the NRC's classification system is that there are safety-related systems which meet all applicable "safety-grade" requirements and there are nonsafety systems which need not meet any of the "safety-grade" requirements, but there is nothing in between such as that described by Staff and Licensee namely, different quality levels for plant features with differing safety roles and varying degrees of importance to safety.

I.D., ¶ 980.

The Licensing Board captured the heart of the controversy and correctly stated the UCS position, which is repeated in the UCS Brief at 97 (" . . . once a system is determined to be important to safety, and its design basis established, it must meet the applicable GDC. That is what makes a system safety grade."). See also UCS Proposed Finding of Fact 479 and Tr. 8100-01 (Pollard).

UCS contends that "Mr. Conran challenges UCS's assertion that when a system is determined to be 'important to safety,' it has been required to meet the applicable GDC which form the definition of 'safety-grade'." UCS Brief at 90. The Staff witness testified, however, that the General Design Criteria cover and apply to more than safety-grade structures, systems and components. Tr. 8415-16 (Conran). This is clear from the regulations themselves. See, e.g., GDC-17, Appendix A to 10 C.F.R. Part 50. The Staff's position is not as UCS characterizes it, and it does not render " . . . the phrase

'important to safety' virtually meaningless as a regulatory concept since no regulatory consequences whatever flow from it." See UCS Brief at 96. The Staff's position is that there are systems and components which are "important to safety" and to which some of the General Design Criteria apply, even if they do not have an explicit, critical safety function to perform in the context of accident response, and therefore are not "safety-grade." Compliance with the GDC for those systems and components nevertheless is considered important to safety in providing reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.^{13/} The Staff witness provided and explained examples of such systems and components -- condensate and feedwater systems, waste management systems, radioactive effluent processing and control systems -- and the applicable GDC. Tr. 8484-88 (Conran).

UCS contends because some non-safety-grade systems were used to mitigate the TMI-2 accident, this illustrates that those systems were erroneously classified and should be safety-grade. Pollard, ff. 8091, at 14-4 to 14-6. It is acknowledged that non-safety-grade systems and components were used in the mitigation of the TMI-2 accident. It is important to remember,

^{13/} The NRC Staff reviews equipment and components which are important to safety, but not safety-grade. See Tr. 7689-90 (Keaten); Tr. 8394-96 (Conran).

however, that resort was made to use of non-safety-grade systems and components in the accident mitigation role only after improper operation of installed safety systems had resulted in severe core damage and other beyond-design-basis conditions. Conran, ff. Tr. 8372, at 8. The central issue is not whether these systems were used, but whether they are required. The real test is whether it is acceptable to have the subject system or component unavailable. If it is acceptable to have a given system unavailable because there are other systems which can protect the health and safety of the public, but the system in question is used because it is available and perhaps familiar to the operators, it need not be fully safety grade. Tr. 7573-74, 7867 (Keaten). At the time of the accident, TMI-2 had operable safety-grade systems which were fully capable of preventing core damage. Tr. 7703 (Keaten).

The Licensing Board properly found that "[a]ll nonsafety-grade systems which might conceivably be called on to mitigate the consequences of an accident need not necessarily be required to meet all safety-grade criteria." I.D., ¶ 1003.e.

UCS states that its Exceptions 73-77 and 82 challenge the application to TMI-1 of the Staff's definitions and criteria for upgrading equipment.^{14/} See UCS Brief at 97. In an attempt

^{14/} The argument in support of these exceptions (UCS Brief at 97-99) tracks UCS Proposed Findings of Fact 518-524.

to summarize the testimony of Staff witness Conran on the TMI-2 accident, UCS has distorted it. See UCS Brief at 97, 98. The cited testimony states as follows:

The severe effects produced in the TMI-2 accident (e.g., serious core damage; voiding in the primary coolant and hydrogen gas generation which may have blocked natural circulation; dispersal of large amounts of radioactive fission products in the primary coolant; etc.) did not result from non-safety system or component failure alone. If operator action had not interfered with the proper functioning of the installed safety systems to their design capability, the safety systems could have accommodated the effects of the non-safety component failures that occurred, and still have prevented the serious core damage and other outside-design-basis effects that resulted. And if the core damage and other outside design-basis effects which occurred had been prevented, it would not have been necessary to call upon non-safety components to assist in accident mitigation and recovery (e.g., long term maintenance of core flow and cooling with RCP's and steam generators).

Conran, ff. Tr. 8372, at 11. While UCS is correct (UCS Brief at 98) that the reactor coolant pumps were used for 1 hour and 40 minutes into the TMI-2 accident, it ignores the fact that High Pressure Injection (i.e., a safety system operation) was terminated early in the accident. See UCS Ex. 1.

UCS also describes the absence of "prudence criteria" for the Staff's decisions to require the upgrading of some systems and components to less than fully safety-grade design criteria. UCS Brief at 91, 98-99. These arguments focus

uniquely on the testimony of one Staff witness, when the evidentiary record includes a vast amount of testimony, in response to Board Question 2 and the former UCS Contention 13, which explains in detail the Staff's decision-making processes on equipment and procedure modifications made as a result of the lessons learned from the TMI-2 accident. See I.D.

¶¶ 1084-1138.^{15/} We understand that the Staff presented Mr. Conran to answer UCS Contention 14, and not to defend every element of the TMI Action Plan. In any case, the Licensing Board realistically recognized the role of Staff judgment, rather than the explicit criteria UCS apparently craves, in determining which systems and components should be upgraded. See I.D., ¶ 993. By attacking Mr. Conran's testimony as if it were the only evidence on the exercise of the Staff's judgment, UCS simply ignores the fact that the entire record on plant design and procedures issues is devoted to an examination of the Staff's judgments in recommending certain modifications and not others.

UCS alleges, in its argument in support of Exceptions 83 and 84, that the Partial Initial Decision is deficient in that the Licensing Board failed to require the performance of a

^{15/} UCS did not attend the hearing sessions at which the evidence was heard on these Board Questions. In addition, UCS is in error when it states (UCS Brief at 92) that no safety analyses have been performed for the modifications. See Licensee Ex. 1, sections 2 and 8.

systems interaction study of TMI-1, either as a short-term or long-term requirement. See UCS Brief at 89-90, 101-103. UCS's argument, however, overlooks the current status of the Staff's program on systems interaction studies and misrepresents the Licensing Board's ultimate disposition of this matter.

The status of the Staff's program for conducting systems interaction studies was discussed during the evidentiary hearing in the Staff's testimony presented in response to Board Question 3, which requested an explanation of the Staff's Interim Reliability Evaluation Plan ("IREP") and its applicability to TMI-1.^{16/} As the Licensing Board noted, Board Question 3 was propounded due to that Board's "concern for having adequate systems interaction studies performed for TMI-1." I.D., ¶ 1183. Staff witness Rowsome, of the Division of Systems and Reliability Research, Office of Nuclear Regulatory Research, explained that IREP studies, utilizing an event-tree/fault-tree technique, were currently being performed on five plants and that the results of those studies, in conjunction with the Staff's investigation of other possible methodologies, would allow the Staff to develop a policy on the best method for conducting systems interaction studies. See generally I.D., ¶¶ 1185-1188.

^{16/} UCS did not submit proposed findings on Board Question 3; nor did it address this Board Question in its exceptions. See I.D., ¶ 1182.

Mr. Rowsome further testified that the Staff has not formally issued any requirement that each licensee perform an IREP-type study of its own plant, pending the development of a standard set of procedures and an adequate method of performing such studies. I.D., ¶ 1189. The Staff does, however, anticipate that a program will be developed by late 1982, at which time all licensees will be required to conduct IREP-type studies. Tr. 15,629-30 (D. Ross).

The "Staff's Response to Licensing Board's Directive to Report Details of Its Enforcement Plan . . .", February 1, 1982, at pages 8 and 9, reported that the Staff is still formulating and testing methodologies and guidance for the performance of systems interaction studies by licensees and is not presently imposing generic requirements for the performance of such studies. This position is in accord with the Licensing Board's findings that it would be premature to require licensees to perform systems interaction studies prior to the development of a standard methodology. I.D., ¶ 1191; see also I.D., ¶ 998. The Licensing Board did express its concern that the Staff's Response did not clearly set forth that TMI-1 would be included in future generic systems interaction reviews, as required in ¶¶ 1000 and 1003(f) of the Partial Initial Decision. ASLB Memorandum and Order Modifying and Approving NRC Staff's Plan of Implementation, April 5, 1982, at 6. The Licensing Board went on to note,

however, that it has since been assured by the Staff that if the five initial IREP studies are shown to be useful and worthwhile, TMI-1 would be included in the follow-on generic studies. The Licensing Board found that this plan of action by the Staff conforms to the intent of its order. Id. at 6, 7.

UCS's arguments in favor of requiring a systems interaction study of TMI-1 have totally failed to acknowledge the fact that a proven methodology for performing such studies has not been developed. Rather, UCS would have Licensee perform an "analysis" of safety and non-safety interactions (UCS Brief at 103) using an unspecified methodology which may later be shown to be inadequate in achieving its goals. Licensee submits that the procedure proposed by the Staff and approved by the Licensing Board is the only appropriate method by which to proceed on this issue, and that any requirement to perform a systems interaction study at TMI-1 now would be premature.

Finally, in Exception 65 UCS attacks the Licensing Board's finding, made in response to UCS argument below, that Staff witness Conran was qualified to present his testimony. See I.D., ¶ 1002. In so doing, the Licensing Board observed that UCS had misstated the record regarding Mr. Conran's experience in the safeguards field. Id. In its argument, UCS asserts that the witness has little, if any, experience in the systems interaction issue. UCS Brief at 93. This was not, of course, the only issue

raised in the contention. In fact, however, Mr. Conran was a member of the Staff's Lessons Learned Task Force and works on the systems interaction issue. That issue is one that Mr. Conran was most concerned with and to which he most contributed, including assistance in the formulation of the Task Force's conclusions. Tr. 8348-50 (Conran). It is equally frivolous for UCS to assert that it is damning for Mr. Conran to have relied upon the expertise of others. Leaving aside the obvious fact that such reliance is necessary for most mortals, systems interaction work calls for such input from others.^{17/} The Licensing Board correctly found Mr. Conran qualified to present the Staff testimony on this subject.

C. Pressurizer Heaters
(Exceptions 16-23)

UCS asserts, in its Contention 3, that the pressurizer heaters and associated controls are necessary to maintain natural circulation and, therefore, should be classified as important to safety and meet applicable safety-grade design criteria. Based upon the Licensing Board's findings on system classification (UCS

^{17/} In addition, Mr. Conran's testimony and definitions do not represent a solo effort. He consulted with senior technical and management personnel throughout the Staff, and his testimony (including the definitions) was officially endorsed by Dr. Ross, who testified on other design issues. Tr. 8317-18 (Conran).

Contention 14), the inquiry here was whether the pressurizer heaters are required for the critical accident prevention, safe shutdown, and accident consequence mitigation safety functions identified in 10 C.F.R. Part 100. See I.D., ¶¶ 975, 976. Since portions of the pressurizer heaters form a part of the reactor coolant pressure boundary, the heaters already conform to safety-grade requirements associated with that function (i.e., maintaining the integrity of the boundary). Keaten and Brazill, ff. Tr. 7558, at 17. The remaining two questions, then, are whether the pressurizer heaters are necessary to assure: (a) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (b) the capability to prevent or mitigate the consequences of accidents which could result in potential off-site exposures comparable to the guideline exposures of 10 C.F.R. Part 100. See I.D., ¶ 975.

UCS conceded at the hearing that the pressurizer heaters are not required to maintain pressure control in the reactor coolant system. In his pre-filed testimony, Mr. Pollard concurs in a statement attributed to the Staff to the effect that the availability of pressurizer heaters is "important" to pressure control. Pollard, ff. Tr. 8182, at 3-7. On cross-examination, Mr. Pollard admitted that natural circulation can work without the pressurizer heaters, that one can mitigate a loss-of-coolant accident without the pressurizer heaters, and

that the core can be adequately cooled without the pressurizer heaters. Tr. 8238, 43 (Pollard). Consequently, under the Licensing Board's test, it follows that the pressurizer heaters need not be safety grade because of their pressure control role during natural circulation.

In fact, credit for operation of the pressurizer heaters is not assumed in the safety analysis of design basis accidents. Jensen, ff. Tr. 8712, at 6; Tr. 8717-18 (Jensen). In addition to the fact that natural circulation is not required, natural circulation cooling, in turn, can be accomplished by maintaining reactor coolant system pressure with two methods in addition to the normal mode of utilizing the pressurizer heaters: (a) solid water operation with the Makeup and Letdown System; or (b) solid water operation with the High Pressure Injection System.^{18/} Keaten and Brazill, ff. Tr. 7558, at 17; Tr. 7923-24 (Brazill).

Neither is operation of the pressurizer heaters necessary to shut down the reactor and maintain it in a safe shutdown condition. Jensen, ff. Tr. 8712, at 4. Consequently, it is clear that the pressurizer heaters -- under the tests set for determining whether structures, systems, and components must

^{18/} This latter method is functionally equivalent to the feed-and-bleed operation, except that the equipment may be operated for pressure control rather than for core cooling per se. Keaten and Brazill, ff. Tr. 7558, at 17.

be safety grade -- are not required to assure the health and safety of the public.

UCS, in its brief in support of exceptions to the Licensing Board decision on Contention 3, goes to some length to assert that reactor coolant system pressure control is an important lesson learned from the TMI-2 accident. UCS Brief at 16, 17. The facts are, however, that power was not lost to the pressurizer heaters during the TMI-2 accident, and the failure to maintain reactor coolant system pressure during the accident was not related in any way to operation of the pressurizer heaters. Tr. 7561 (Keaten). Nevertheless, the Staff recommended that steps be taken to improve the reliability of the power supplies to the heaters. See Jensen, ff. Tr. 8712, at 6, 7.

UCS criticizes the Licensing Board for finding that there are means to control pressure other than with the pressurizer heaters, rather than explicitly stating that the heaters are sufficiently reliable to ensure the availability of natural circulation. UCS Brief at 18. The Licensing Board, however, was simply addressing the main UCS contention that the heaters must be safety grade, and therefore examining whether they were required.

Before addressing the UCS exceptions further, Licensee must emphasize the remoteness of the situation under discussion in the UCS Brief: loss of the pressurizer heaters and

maintenance of system pressure through solid operation. First, there has never been a loss of off-site power at Three Mile Island, Tr. 7566 (Brazill), Tr. 8032 (Keaten), and the reliability of the off-site power system is sufficiently high that such an event is not expected to occur during the lifetime of the plant.^{19/} Capodanno et al., ff. Tr. 5642, at 14. Second, the need for alternatives to pressure control with the pressurizer heaters presumes: (a) an extended loss of off-site power (i.e., no recovery for a long period of time); and, (b) that the pressurizer heaters are not manually connected to the diesel generators. Tr. 7567 (Brazill). Further, a very conservative estimate is that the operators have two hours in which to connect the pressurizer heaters to the on-site power supply if necessary. Tr. 7565-66 (Brazill).

UCS argues that there are serious safety disadvantages to solid water operation as an alternative to natural circulation with the pressurizer heaters. See UCS Brief at 18, 19. UCS contends that it is extremely difficult to control reactor coolant system pressure in the solid mode while making any changes whatever to the plant condition. Id. at 18. Licensee's

^{19/} The NRC designation of loss of off-site power as an "anticipated operational occurrence" (i.e., expected to occur one or more times during the life of the plant) for design purposes (Appendix A to 10 C.F.R. Part 50) does not constitute a studied conclusion that the probabilities of such an occurrence would actually be such at TMI.

witnesses, however, presented data on the compressibility of water in the plant primary system, and explained that, recognizing the existing operating instructions, some 16 minutes would elapse, for example, before the plant pressure would go from normal to the safety valve set point. Tr. 8053-55 (Brazill); Tr. 8057 (Keaten). This is ample time for operator control. In addition, there is experience with this mode of operation, since TMI-2 operated for a very long time after the accident with a solid pressurizer. Tr. 8055-56 (Keaten). Further, any concerns regarding the ability to control primary system pressure without utilizing the pressurizer heaters will be put to rest by the demonstration test required by the Licensing Board. In this test, Licensee will be required to demonstrate the ability to control pressure with the Makeup and Purification System, without reliance on the pressurizer heaters. See I.D., ¶ 775.

UCS points out the Staff's long-term requirement to make emergency feedwater systems fully safety grade, even though alternatives are available for removing decay heat, and argues that alternatives to pressure control with the pressurizer heaters should not preclude the UCS proposed requirement that the pressurizer heaters be safety grade. UCS Brief at 19. This argument, however, ignores the critical difference between the restoration time called for in a loss of all feedwater event versus a loss of pressurizer heaters event. Emergency feedwater

might have to be restored in as little as twenty minutes, whereas at least two hours is available to return power to the pressurizer heaters. See Jones and Broughton, ff. Tr. 5038, at 5-6, 8, 13-14, 19; Tr. 7565-66 (Brazill).

The second major line of argument advanced by UCS here is that operation of the HPI pumps, to add primary coolant to maintain pressure if the pressurizer heaters are lost, constitutes a challenge to the Emergency Core Cooling System. UCS Brief at 20, 21. UCS simply is in error here. The makeup function of the HPI pumps is a part of normal plant operation. The makeup system is operated all the time during plant operation, so that this particular HPI nozzle has water from the makeup system flowing through it all the time. Consequently, use of the makeup system in controlling plant pressure would not place a thermal cycle on the HPI system. Tr. 8715 (Jensen). The operation does not constitute a challenge to the ECCS.

A third argument under the exceptions on UCS Contention 3 attacks the Licensing Board's findings on feed-and-bleed cooling. UCS Brief at 21-24. This argument is repeated several times throughout the UCS Brief on other contentions and Board questions. Here, UCS criticizes the Licensing Board on the extent of its findings on feed-and-bleed cooling when, in fact, the Licensing Board examined the matter in detail under Board Question 6 (on emergency feedwater reliability) and apparently

was not plagued by the UCS penchant for repeating itself every 20 to 30 pages.

The contention here is that the pressurizer heaters should be safety grade. The only way feed-and-bleed cooling enters the picture is because, in determining whether pressurizer heaters are required for safety, the Licensing Board explored alternative means for pressure control and found that there are two -- one of which is the equivalent to feed-and-bleed operation. See I.D., ¶ 752. One would do -- solid water operation with the Makeup and Letdown System. Id. at ¶ 754.

In any case, the Licensing Board's findings on the capabilities of the pressurizer safety valves, and the adequacy of the EPRI test program to reveal any potential design deficiencies -- while not included in the findings on pressurizer heaters -- are well supported by the record.^{20/} See I.D.,

^{20/} Inexplicably, in the midst of this argument UCS launches into its Exception 31 on the Licensing Board's evidentiary rulings with respect to steam generator tube ruptures. See UCS Brief at 23. First, the complaint was not raised in proposed findings before the Licensing Board. See Public Service Electric and Gas Company, et al. (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 N.R.C. 43, 49 (1981) (exceptions must relate to matters raised in the party's proposed findings of fact and conclusions of law). Second, the argument contains no citations to the record, and is based in part on material not in the record. See Duke Power Company (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 N.R.C. ____ (March 30, 1982), slip op. at 53 (appeal must be decided on the basis of the Licensing Board record). Third, Licensee can make no technical sense of the UCS attempt to relate the Ginna incident to use of the pressurizer safety valves for feed and bleed cooling. UCS, however, apparently assumes a massive loss from the primary to secondary systems, unlike the Ginna event.

¶¶ 1071-1075, 1082-1083.

UCS also complains about the Licensing Board requirement that Licensee demonstrate satisfactory reactor coolant pressure control using the HPI system.^{21/} UCS Brief at 24, 25. UCS states that "[n]o one questions that cooldown can theoretically be accomplished with pressure control via HPI," and that "[a] one-time 'demonstration' performed under highly controlled conditions can do little but confirm the theoretical proposition that no party seriously disputes." Id. at 25. Thus it appears that no planned test would satisfy UCS, and the specific complaints about this one are academic.^{22/}

The remainder of the UCS Brief (Exceptions 22 and 23) addresses issues discussed above with respect to Contention 14 (i.e., the meaning and application of "important to safety") or repeats earlier arguments on Contention 3. See UCS Brief at 26-28.

^{21/} UCS displays its perverse reasoning again here with the proposition that if something is to be tested, one must first have determined that it is unproven and "unacceptably risky." UCS Brief at 24-25. Of course, plant systems are tested routinely without any such finding as a condition precedent.

^{22/} Other aspects of the UCS argument on this test are the subject of UCS Exception 115.

D. Connection of Pressurizer Heaters to Diesels
(Exceptions 24-30)

Licensee has made provision, in accordance with short-term recommendation No. 8 of the Commission's August 9, 1979 Order and Item No. 2.1.1 of Table B-1 of NUREG-0578 referenced therein, to enable Licensee to connect either of two groups of non-safety grade pressurizer heaters to the plant's emergency power supply in the event of a loss of off-site power. UCS's claim is that Licensee's design does not meet the requirements of Regulatory Guide 1.75, and therefore does not meet the single failure criterion of General Design Criterion 17, for protection of the on-site power supply against a fault in the pressurizer heaters.

In the event of a loss of off-site power either of two pressurizer heater groups can be connected to the emergency power supply. Two circuit breakers are provided between each pressurizer heater group and the main breaker of the 480 volt bus to which it is connected to assure isolation of the pressurizer heater from the bus and to prevent actuation of the main bus breaker in the event of a fault in the pressurizer heater. The first circuit breaker downstream of the main bus breaker is denominated the "main feeder breaker." A second circuit breaker downstream of both the main bus breaker and the main feeder breaker is denominated the "distribution breaker." Torcivia and Shipper, ff. Tr. 9098, at 2-5, Fig. 1; Tr. 9101-02 (Torcivia).

The distribution breaker, i.e., the breaker closest to the pressurizer heaters, is designed and set to trip in the event of a fault current in the range of 900 to 1100 amps. The breaker trip would occur in approximately 0.2 seconds or less. Tr. 9104 (Torcivia).

The main feeder breaker is designed and set to trip on three different signals:

1. An overcurrent or fault current in excess of 1250 amps. A current of this magnitude would trip the main feeder breaker in approximately 0.2 seconds. Tr. 9104 (Torcivia).
2. Undervoltage occurring as a result of a major fault in the pressurizer heater with an approximately 1-1/5 second time delay. Tr. 9425-26 (Torcivia).
3. Any of the three ES signals which actuate the engineered safeguards systems. Torcivia and Shipper, ff. Tr. 9098, at 4, as corrected at Tr. 9427-29 (Shipper).

In contrast to the distribution and main feeder breakers, the main bus breaker would trip only at overcurrents in excess of 1250 amps and then only after a lapse of up to 15 seconds. A trip of either the distribution or main feeder breaker within this time period would cut off the fault current to the main bus breaker and thus prevent a trip of that breaker. Tr. 9104-06 (Torcivia).

UCS's contentions and exceptions rely entirely on its claim that the TMI-1 circuit breakers between the pressurizer heaters and the main bus breaker do not meet the requirements of

Regulatory Guide 1.75. These requirements are discussed below. It should be noted at the outset, however, that UCS provided no independent technical data challenging Licensee's testimony as to the adequacy of the breakers or showing that the circuit breakers would not adequately perform the isolation function for which they were designed.

Licensee testified that the main feeder breaker is fully safety grade and that the distribution breaker is fully safety grade except for being situated in a structure that has not been seismically qualified. Tr. 9111-12, 9121-22 (Torcivia). Except for its claim that the breakers do not meet the requirements of Regulatory Guide 1.75, UCS did not challenge this testimony. Licensee also emphasizes that the trip points on the distribution and main feeder breakers are set far below the trip point on the main bus breaker, especially as to the time setting of the breakers. As previously stated, the distribution and main feeder breakers are set to trip within approximately 0.2 seconds, while the main bus breakers would not trip for up to 15 seconds and would not trip at all upon the opening of the downstream breakers. Licensee's expert witness expressed great confidence in the reliability of the coordination between the main feeder breaker and main bus breaker with settings so far apart. Tr. 9601 (Torcivia). The breakers conform fully to the requirements of IEEE 384 (1977). Tr. 9113-17 (Torcivia).

In contrast, UCS witness Pollard was able only to refer in generalities to unnamed instances at other plants where, despite an attempt to have proper breaker coordination, a fault subsequently resulted in tripping the "equivalent of the main breaker." Tr. 9652 (Pollard). He was able to give only a single example involving an unidentified piece of equipment and was unable even as to that example to give any indication of the margin between the setting of the main breaker and of the downstream breaker. Tr. 9654 (Pollard).

Regulatory Guide 1.75 reads in pertinent part:

However, because the main breakers are in series with the fault and could experience momentary currents above their setpoints, it is prudent to preclude the use of interrupting devices actuated only by fault current as acceptable devices for isolating non-Class-1E circuits from Class 1E or associated circuits.

Breakers that trip on receipt of a signal other than one derived from the fault current or its effects (e.g., an accident signal) are acceptable since the downstream circuits would already be isolated from their respective power sources under accident conditions and could pose no threat to these sources.

As previously indicated, testimony in the proceeding established that in accordance with Regulatory Guide 1.75 the circuit breakers, in addition to tripping on fault currents or low voltage, would also trip on an ES signal. No one questioned these facts. UCS argues, however, that after the breakers have been tripped by an ES signal, the pressurizer heaters could be

reconnected to the emergency power supply when the ES signal is no longer present. UCS further argues that in this circumstance the breakers would trip only on a fault current or low voltage and that tripping would therefore be dependent solely on a fault current or its effects. On this point the Licensing Board agreed with UCS.

That Board did not, however, as the UCS brief alleges, find that the TMI-1 design "violated" Regulatory Guide 1.75. It found instead, in agreement with the testimony of the Staff, that Regulatory Guide 1.75 did not cover and was not intended to cover the special conditions hypothesized by UCS. Thus the Licensing Board found that "the drafter of RG 1.75 and its basis IEEE Std 384-1974, probably did not foresee reconnection of non-Class 1E loads after isolation." I.D., ¶ 769. The Licensing Board further added, in a sentence omitted from UCS's quotation of the Board's findings, "that the drafter probably assumed that, once isolated, the loads would remain so until power conditions returned to normal." Id. Far from finding the TMI-1 design in violation of Regulatory Guide 1.75, the Licensing Board expressly endorsed the Staff's position that regulatory guidance must be obtained outside Regulatory Guide 1.75 and was properly sought elsewhere. Id.

The Staff sought and obtained such guidance from Section 8.3.1 of the Standard Review Plan and from prior Staff

practice. The Staff explained that the critical purpose of Regulatory Guide 1.75 in requiring a second isolation signal such as the ES signal, was to assure that during the initial critical phase of an accident there would be no possible interference with the loading of the essential safety systems on the emergency power supply. It has been consistent Staff policy, in accordance with Section 8.3.1 of the Standard Review Plan and its interpretation of Regulatory Guide 1.75, to allow the connection of non-safety loads to the emergency power supply once accident conditions have been stabilized,^{23/} even though such non-safety loads would be isolated in the event of a fault only by properly coordinated overcurrent circuit breakers. Tr. 9701-03, 9710, 9770-74 (Fitzpatrick). The Staff has approved pressurizer heater connections for other reactors which rely on the same combination of overcurrent and ES trip signals as TMI-1. Tr. 9759-61, 9784-85 (Fitzpatrick).

In the event that the reactor operator determines that plant systems have not stabilized following an accident, he need not connect the pressurizer heaters. The Board has already found that other means are available for maintaining natural

^{23/} The Staff witness did not state, as the UCS brief incorrectly alleges, that stabilization would occur at the point at which the diesels are loaded. This definition applied only to the stability of electric power supply. The reactor operator would also consider the stability of other systems. Tr. 9712-13 (Fitzpatrick).

circulation. The Staff's lessons-learned recommendations and NUREG-0578 on which they were based do not require connection of the heaters in the scenario hypothesized by UCS. As pointed out by the Licensing Board, the stated purpose in making provision for connection of the heaters to the diesel generators was to "establish and maintain circulation at hot standby conditions."^{24/} As explained in NUREG-0578, Section 2.1.1, the purpose of the connection was to assure under non-accident conditions a means of natural circulation control not involving a challenge to the emergency core cooling system. In the UCS scenario that challenge, i.e., actuation of the ECCS, has already occurred.

UCS faults the Licensing Board for its observation that not meeting the specific guidance of Regulatory Guide 1.75 does not mean that the circuit breakers will not protect emergency power equipment. Regulatory Guide 1.75 itself recognizes that proper breaker coordination would preclude tripping of the main bus breaker. The measures which Licensee has taken to assure proper coordination and to protect the main bus breaker against a "momentary" overcurrent have already been described. The Licensing Board properly took these measures into account.

^{24/} The UCS brief at page 36 misquotes and perhaps for that reason misconstrues the purpose of the Licensing Board's observation. The misquote consists simply of omitting the words "at hot standby conditions" from that Board's statement.

E. Valves
(Exceptions 31, 33-45)

UCS Contention 5 asserts that the pressurizer power-operated relief valve ("PORV"), its associated block valve, instruments and controls should be modified to meet all safety-grade design criteria. The Licensing Board's decision on this contention, I.D., ¶¶ 774-792, reflects a thorough consideration of the UCS arguments presented on appeal, most of which closely track the proposed findings UCS filed with that Board.

As with the pressurizer heaters (section II.C., supra), the proposed UCS modification to the PORV and its block valve was assessed against the background of the Licensing Board's findings on system classification (UCS Contention 14) to determine whether they are required for critical safety functions. The Licensing Board correctly found that

. . . [P]roper operation of the PORV and associated block valve, and the instruments and controls for these valves is not required to mitigate the consequences of design basis LOCAs and, although the failure of the PORV can create or aggravate a LOCA, the consequences of such an accident can be safely mitigated by safety-grade equipment. The Board finds, therefore, that the PORV and its block valve should not be required to meet all safety-grade design criteria, except for those applicable to their role as a part of the reactor coolant system pressure boundary.

I.D., ¶ 792. The PORV is fully qualified as a reactor coolant system pressure boundary device. See id. at ¶ 781.

UCS contends here that the Licensing Board "ignored and failed to confront UCS's evidence" on whether or not the PORV performs a safety function during low temperature operation. UCS Brief at 42. The Licensing Board, however, clearly did not ignore the UCS evidence (it is, in fact, cited by the Licensing Board), and confronted UCS with the reasons why it was not endorsed. See I.D., ¶ 790.

In a portion of its argument on low temperature operation, UCS states that ". . . Licensee agreed that, if the plant is in cold shutdown condition with the reactor coolant system solid, the PORV 'may' serve a safety function in relieving the overpressure." UCS Brief at 43. The complete testimony given by Mr. Jones follows:

If you are in a cold shutdown condition without a bubble and you assume that you have taken no other actions to prevent overpressurization events from being credible, then it is possible that the PORV may serve a safety function in relieving the overpressure. However, the operator still has the capability to terminate an overpressurization event, should it occur. The PORV could still just be a backup mode.

Tr. 8979 (Jones). This testimony followed repeated statements by Mr. Jones that he was not sufficiently familiar with conditions under which the plant is allowed to operate in a solid condition. Tr. 8977-79 (Jones). UCS never proved that the plant would be operated "solid" while in a cold shutdown condition. Continuing this hypothetical discussion UCS, in its argument, boldly

attributes to Licensee witness Jones testimony to the effect that with the primary system solid the operator does not have time to act [to relieve overpressure]. See UCS Brief at 43. What Mr. Jones actually testified is that the operator probably does not have 10 minutes to act.^{25/} Tr. 8976 (Jones).

UCS repeats, albeit briefly, that the role of the PORV in feed-and-bleed cooling warrants making the PORV safety grade. UCS Brief at 44. First, it is clear that the PORV is not required for feed-and-bleed cooling. I.D., ¶ 791. Second, feed-and-bleed cooling itself is not required except for events which are clearly beyond the design basis, single failure criteria: an extended loss of all main and emergency feedwater^{26/} or for certain accident conditions in conjunction with an extended loss of all feedwater. Jones, ff. Tr. 4588, at 3; Tr. 5201 (Jones).

The Licensing Board fully considered UCS's arguments on the role of the PORV in inadequate core cooling situations. It found that while the PORV is possibly useful equipment for

^{25/} Similarly, the conclusions UCS would draw from the plant technical specifications on isolating the PORV are not supported by any evidence, and UCS cites none. See UCS Brief at 43, 44.

^{26/} The Licensing Board found that the TMI-1 emergency feedwater system at restart will be safety grade for small-break LOCAs and loss-of-main-feedwater transients. I.D., ¶ 1057.

depressurization under these conditions, it is not required for safety reasons since procedures have been developed for coping with inadequate core cooling conditions without dependence on the PORV. I.D., ¶ 791. Beyond that, however, there is no foundation for the UCS assertion that because the plant procedures tell the operator to use the PORV, along with depressurizing via the steam generators, in an inadequate core cooling event beyond the plant design basis, then it is "needed" in the sense of being required for safety. See UCS Brief at 45.

UCS clearly has misread the Partial Initial Decision when it attributes to the Licensing Board apparent agreement with UCS that the PORV is "inconsistent with GDC 14" in that it does not have an "extremely low probability" of failure.^{27/} See UCS Brief at 41, 46. The Licensing Board, after discussing the provisions of GDC 14 (I.D., ¶ 785), states:

Moreover, if it is decided that the current arrangement of PORV and its block valve does not meet the requirements of GDC 14, then the Commission could specify changes in design or, possibly, specify operation with the block valve closed and de-activated. The Board does not recommend either of these options since it seems to the Board that the Staff has made a reasonable interpretation of the regulatory requirements by specifying documentation -- "that the PORV will open in less than 5% of all anticipated overpressure transients --" (Staff Ex. 12, at

^{27/} UCS Exception 35, on the other hand, asserts that the Licensing Board erred in failing to find that the design at TMI-1 violates GDC-14.

II.K.2.14-1), in addition to the other requirements discussed below.

I.D., ¶ 786. Thus, the Licensing Board found that the Staff has properly applied GDC-14 to TMI-1, and that the Licensing Board does not recommend changes in design or operation of the PORV and its block valve to meet the provisions of GDC-14. UCS has it exactly backwards.^{28/}

Turning to safety system challenges, UCS argues:

It is self-evident that if the frequency with which ECCS is called upon to function may be greater than its design basis, then reducing the frequency of such challenges is a function that is itself important to safety.

UCS Brief at 46. There is absolutely no evidence (and UCS cites none), however, to support the speculation by UCS that the number (frequency is irrelevant) of ECCS actuations at TMI-1 may exceed the system's design basis, or that the only answer to such a situation would be to make the PORV safety grade.

It must be remembered that the scenario UCS is addressing here is where the PORV is opened and the block valve cannot be closed.^{29/} UCS Brief at 47. The Licensing Board found

^{28/} Neither did the Licensing Board, in paragraph 786 of the Partial Initial Decision, essentially waive compliance with GDC-14 because TMI-1 is an "operational" plant. See UCS Brief at 47 and Exception 36. Given the ultimate conclusions in that paragraph, the Licensing Board's observations on the vintage of the plant must be viewed as gratuitous.

^{29/} UCS witness Pollard could identify no single failure which would cause the existing PORV to fail open and prevent the existing block valve from being closed. Tr. 9047 (Pollard).

that the modifications undertaken since the TMI-2 accident have reduced the frequency of PORV challenges, and that changes have been made at TMI-1 to enhance the operator's ability to recognize and terminate a transient caused by a stuck-open PORV. I.D., ¶¶ 783, 788. Further, while Licensee agrees that it is desirable to avoid unnecessary challenges to the ECCS, plants are designed to have a given number of safety equipment actuations, including some which may be inadvertent. As long as the number of design cycles for the ECCS is not exceeded, there is no violation of any safety limits. There are, in fact, no regulatory criteria on how often safety systems may be challenged. Tr. 8756-59 (Jones). It is, of course, the ultimate function of a safety system to mitigate the failure of a non-safety system. Tr. 7582-83 (Keaten).

UCS Exception 31, which is quoted in the UCS Brief at 42, is not supported or addressed by the argument which follows. There is merely a cryptic, and totally unhelpful, note to the effect that "[t]he basis for this exception is discussed supra." The Appeal Board would be well justified in dismissing this exception as unbriefed and waived.^{30/} See supra, at 4. It appears, however, that the argument may be found in the UCS Brief

^{30/} UCS Exception 45 has not been briefed at all. There is only a reference to UCS proposed findings. See UCS Brief at 48.

at 23, which in turn cross references Exception 31. Licensee already has addressed that argument. See supra, at 35, n.20. It need only be added that nowhere does UCS even identify the Licensing Board ruling to which the exception refers. The Licensing Board, however, consistently has ruled that the proceeding is bounded by the Commission's Order and Notice of Hearing and the principle that there must be at least a reasonable nexus between the TMI-2 accident and the matters sought to be litigated. See, in this docket, First Special Prehearing Conference Order, LBP-79-34, 10 N.R.C. 828, 832 (1979); I.D., ¶ 24, LBP-81-32, 14 N.R.C. 381, 394 (1981).

F. Natural and Forced Circulation
(Exceptions 1-15)

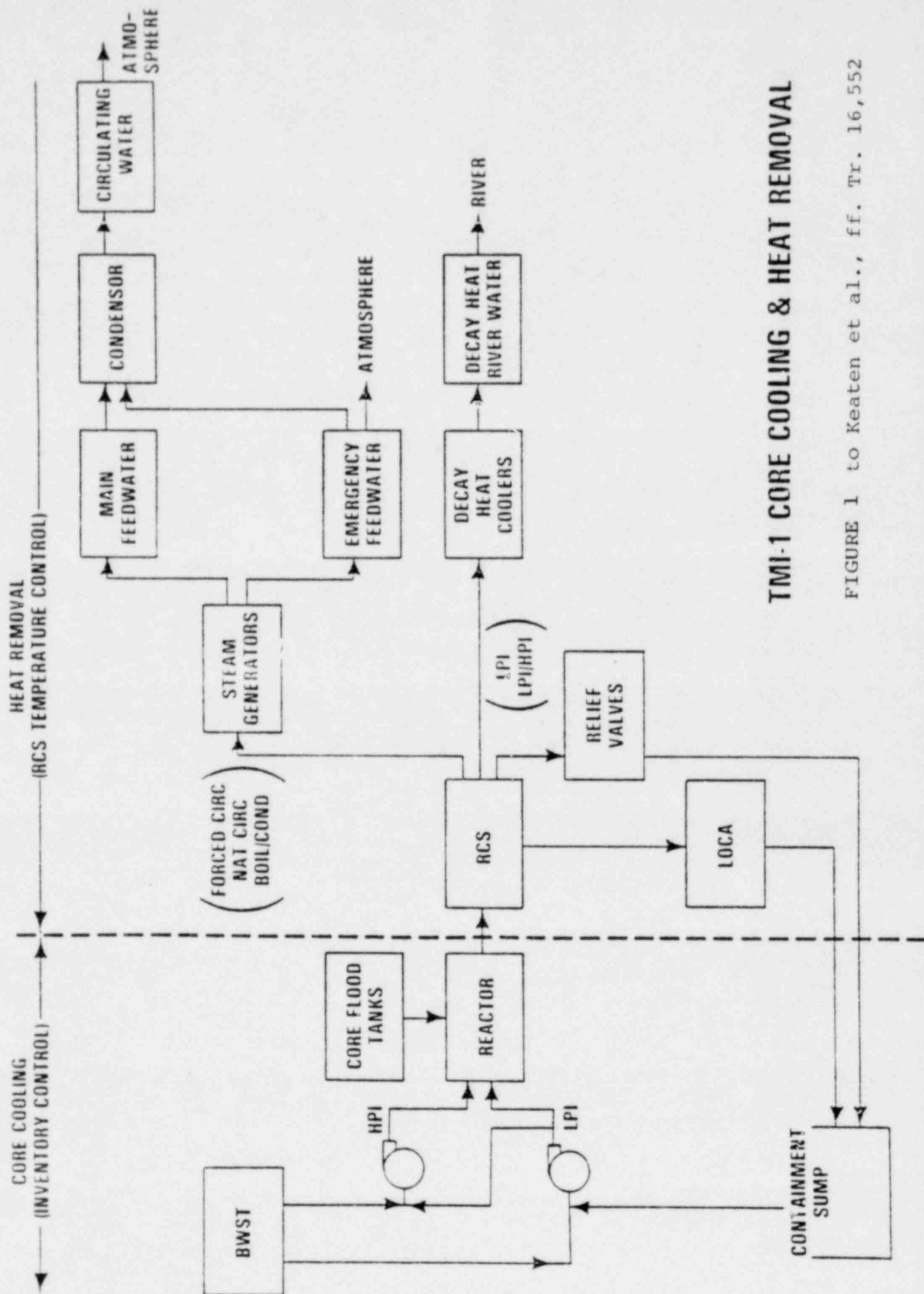
UCS contends that the experience of the TMI-2 accident (UCS Contention 1) and certain specified inadequacies (UCS Contention 2) show the need for a reliable, safety-grade system to provide forced circulation to remove decay heat at TMI-1 in the event of a small-break, loss-of-coolant accident. See UCS Brief at 2. Together, the contentions challenge the adequacy of natural circulation to remove decay heat at TMI-1 in the event of a small-break LOCA. I.D., ¶ 601.

In a well reasoned decision rejecting UCS Contentions 1 and 2, the Licensing Board concluded that operation of one or more reactor coolant pumps is not required in the event of a

small-break LOCA in order to assure adequate core cooling, and that in the event natural circulation is interrupted, the decay heat can be dissipated by other means until natural circulation is restored. I.D., ¶ 629.

Prior to addressing the specific arguments set forth in the UCS Brief, Licensee views it to be important to highlight two underlying issues not explicitly addressed by UCS.

First, UCS fails to distinguish -- in its comments on the TMI-2 accident and the lessons learned from that experience -- the processes of cooling the reactor core and of removing the decay or residual heat from the reactor coolant system. These are different functions, however, and this important distinction was made by all of the witnesses who testified on these issues, and by the Licensing Board in its decision. Adequate core cooling is maintained by the Emergency Core Cooling System ("ECCS") providing the necessary makeup fluid to the primary system to compensate for any loss of coolant and to assure that sufficient fluid is maintained within the reactor vessel. Keaten and Jones, ff. Tr. 4588, at 6. Decay heat is removed from the primary system during a LOCA by the break itself and/or natural circulation, by the boiler-condenser cooling mode if natural circulation is lost, or by the "feed and bleed" cooling mode if both main and emergency feedwater are lost. I.D., ¶¶ 605-608; see also "TMI-1 Core Cooling & Heat Removal," a figure which follows.



TMI-1 CORE COOLING & HEAT REMOVAL

FIGURE 1 to Keaten et al., ff. Tr. 16,552

Second, many of the UCS arguments assume, as a starting point, core damage equivalent to that presumed to exist at TMI-2. The evidence presented by Licensee and the Staff, however, does not assume core damage as some new design basis for plant systems and components. The issue here is not whether natural circulation is adequate to remove decay heat with a damaged core and void blockage in the top of the hot leg.^{31/} In any case, the evidence in this record is uncontradicted that absent premature reduction in HPI flow core damage does not occur as a result of small-break LOCAs. See Jones and Broughton, ff. Tr. 5038, at 2 and 5-8; see generally I.D., ¶¶ 921-970 (Additional LOCA Analysis), as modified by Memorandum and Order Modifying Partial Initial Decision of December 14, 1981, LBP-82-____, 15 N.R.C. ____ (January 26, 1982).^{32/}

UCS begins its argument with a frivolous attack on a Licensing Board observation, made almost in passing, that Licensee witnesses Keaten and Jones "are both familiar with the accident at TMI-2." See I.D., ¶ 609; UCS Brief at 4. These two witnesses testified many times before the Licensing Board on

^{31/} The TMI-2 accident experience indicates, however, that natural circulation can provide adequate heat removal with a damaged core. See Keaten and Jones, ff. Tr. 4588, at 9.

^{32/} UCS filed no proposed findings below on the adequacy of Licensee's small-break LOCA analyses and, as we have noted, has not appealed the Licensing Board's findings on that record.

various plant design issues, so that the finding is supportable solely on the basis of that Board's assessment of the knowledge reflected in that testimony.

In addition, the record shows that Mr. Keaten has been Manager of GPU's Systems Engineering Department since April, 1978, and that he served as Deputy Director of Technical Support at Three Mile Island during the post-accident period. He is the author of "Analysis of TMI-2 Sequence of Events Operator Response" and "The Role of Instrumentation in the TMI-2 Accident." Keaten and Jones, ff. Tr. 4588 (attached statement of qualifications, Robert W. Keaten). See also Keaten and Long, ff. Tr. 13,242, at 1 (Mr. Keaten headed up the GPU investigation into the accident); I.D., ¶ 464, LBP-81-32, 14 N.R.C. 381, 538 (describing Mr. Keaten as a member of Licensee's management who was actively involved in post-accident events).^{33/}

Mr. Jones is a Supervisory Engineer of the Babcock & Wilcox ECCS Analysis Unit. In addition to his analytical work experience with large and small break LOCAs, Mr. Jones has been personally involved, since the TMI-2 accident, in the preparation

^{33/} UCS has provided here a highly distorted view of Mr. Keaten's testimony. See UCS Brief at 4. Mr. Keaten provided a detailed explanation of reactor coolant pump operation in the early period of the accident. Tr. 4608-10. Further, Mr. Keaten did not state that he had not reviewed the accident sequences in detail, but that he had not done such for UCS Exhibit 1 (NSAC chart). Tr. 4612-13; see also infra, at 56-57.

of B&W operator guidelines for small-break LOCAs and inadequate core cooling mitigation. Keaten and Jones, ff. Tr. 4588 (attached statement of qualifications, Robert C. Jones, Jr.). It was hardly necessary for Mr. Jones to state explicitly that he is familiar with the TMI-2 accident.^{34/}

The Licensing Board's observation clearly is well founded in the record, and UCS cites no evidence which would contradict the finding.

The UCS description of the TMI-2 accident, presented in support of Exceptions 1 and 2,^{35/} contains several inaccuracies, which were also included below in proposed findings.

UCS argues that "[l]iquid natural circulation did not become established during the TMI-2 accident because steam or a mixture of steam and hydrogen was trapped in the 180° bend of the reactor coolant system hot legs at the top of the steam generators." UCS Brief at 5. The phrase "during the TMI-2 accident"

^{34/} UCS states that Mr. Jones relied on what he had heard concerning operator actions during the accident. UCS Brief at 4. The testimony cited by UCS deals with one question: why the operators started to depressurize the reactor at 7.5 hours into the accident. Obviously, Mr. Jones was not there at the time, so he relayed his understanding -- based upon information from others -- that the operators were attempting to reach the Low Pressure Injection setpoint. Tr. 4650.

^{35/} Exception 1 makes the incredible assertion that "all of the cooling modes available at TMI-2 during the accident were ineffective." Since the accident was effectively terminated, this exception falls of its own weight.

is too broad here, however, and the testimony cited (Tr. 4616-17 (Jones)), was directed only at the specific time frame 13 to 14 hours into the accident. Tr. 4625 (Jones). Mr. Jones specifically refused to say that some form of natural circulation was never established during the early phases of the accident. Id. In fact, there is evidence that some circulation did occur. See Tr. 5426-27 (Johnston).

UCS argues that "[u]nder the conditions that prevailed from approximately 4 to 16 hours after the start of the accident, the only way to get natural circulation started was to start a reactor coolant pump." UCS Brief at 5. The only evidence cited is Tr. 4617 (Jones). What Mr. Jones actually stated was that during the period around 14 hours into the accident when the operator was overfeeding HPI in order to pressurize the system a steam or steam-hydrogen gas block was trapped in the 180° bend in the top of the hot leg, creating a situation where natural circulation could be initiated by bumping a reactor coolant pump (as was done at TMI-2) or by opening the high-point vents which will be installed at TMI-1. Tr. 4616-17 (Jones).

UCS includes the following statements in its argument here:

It is true that as the Board notes (PID 609), the Licensee's witnesses testified that after adequate high pressure injection flow was restored, subsequent to core damage, the core was effectively cooled even though natural circulation was not occurring. (Keaten and Jones, ff. Tr. 4588, at 8).

Under cross-examination, however, the witnesses testified that their attention had actually centered on the accident up to the time the last reactor coolant pump was initially turned off, at about one hour and forty minutes into the accident. (Tr. 4605, Keaten).

UCS Brief at 5, 6. UCS has grossly misrepresented Mr. Keaten's testimony (only one witness is involved). Mr. Keaten was responding to UCS questions on the NSAC chart on the TMI-2 accident (UCS Ex. 1), and gave the following testimony:

The final comment that I would like to make is, while it is true that GPU participated in developing this information and subsequently commented on earlier drafts of both the report and this chart to the Nuclear Safety Analysis Center, our attention really has been centered more on the time period up to the point at which the last reactor coolant pump was initially turned off, which is at about an hour and forty minutes into the transient. And our review of the subsequent portions of the chart have been much less detailed.

Tr. 4605 (Keaten). Mr. Keaten clearly was discussing GPU's effort in reviewing the NSAC chart, and he was in no way limiting his direct testimony (or his knowledge of the accident) as UCS misleadingly implies.

UCS argues boldly that "the witnesses testified that the first time following the start of the accident when adequate core cooling is known to have been established is at 16 hours when a reactor coolant pump was restarted." See UCS Brief at 6. A complete representation of the testimony of the witness,

Mr. Jones, is that it is probably correct that this is the first time he knows and can document the establishment of adequate core cooling, although his judgment, based upon data on a variety of cited parameters, is that adequate core cooling must have been occurring earlier. Tr. 4655 (Jones); see also Tr. 4652-53 (Jones).

Arguing in support of its Exceptions 3, 4 or 13, UCS ignores (UCS Brief at 7) the basis for the Licensing Board's finding that the TMI-2 accident did not demonstrate that natural circulation is inadequate for removing core decay heat -- the uncontroverted testimony presented by Licensee, and endorsed by the Staff, that the period of inadequate core cooling experienced at TMI-2 did not occur due to any inherent inability of natural circulation, or other decay heat removal processes, but resulted from the premature reduction of high pressure injection (HPI) flow. I.D., ¶¶ 609, 611. Further, contrary to UCS's assertion, the Licensing Board has explicitly recognized that many small-break LOCAs can result in sufficient voiding^{36/} in the reactor coolant system to inhibit natural circulation. I.D., ¶¶ 605, 618.

^{36/} This statement applies only to breaks smaller than approximately .01 square foot; breaks larger than this discharge sufficient energy on their own, such that there would be no reliance on natural circulation or boiler-condenser cooling for energy removal. I.D., ¶¶ 607, 615.

Here, however, UCS goes on to allege that such voids will not be condensed and, by extension, that the boiler-condenser circulation mode would be ineffective in providing a decay heat removal path. The testimony of Licensee witness Jones, relied upon in the cited UCS reply findings, does not support such a statement. Witness Jones, at the pages cited by UCS, was comparing system response where voiding in the "U-bend" of the hot leg is due to the presence of steam bubbles versus voiding due to the presence of noncondensable gases, such as hydrogen. Tr. 4619-21 (Jones). Mr. Jones here is also explaining the transition period between the time boiler-condenser cooling is lost and liquid natural circulation is established, when the primary system is being refilled via the HPI system. Under such conditions, the compression effect provided by the HPI flow would not completely condense the bubble at the top of the hot leg. Further, with the primary system completely filled above the secondary liquid height, no heat transfer surface would be provided to condense the voids. Tr. 4616-21, 4625-26 (Jones). However, following this repressurization cycle, as mass and energy continues to be discharged from the system through the break, the primary system level will thus decrease, resulting in a re-exposed heat transfer surface, allowing the boiler-condenser mode to function. Tr. 4853-54 (Jones). It should also be emphasized that effective core cooling is maintained throughout

the transition to the boiler-condenser mode by the HPI-injected fluid covering the core. See I.D., ¶ 609.

While the Licensing Board correctly relied upon a Staff evaluation which concluded that the expected quantities of non-condensable gases should not interfere with natural circulation or boiler-condenser cooling, I.D., ¶ 619, the record also includes Licensee testimony reporting on the results of its analyses of the effect of noncondensibles on the condensation heat transfer process in the steam generator during a small-break LOCA. These analyses, which included the effects of radiolytic decomposition, determined that sufficient condensation surface would remain within the steam generator and that the boiler-condenser mode would not be prohibited. Jones and Broughton, ff. Tr. 5039, at 27. UCS nowhere challenges this testimony. The UCS attack on the Staff evaluation^{37/} rests solely on its unsupported argument that the design basis should be extended to include a damaged core.^{38/} See UCS Brief at 7, 8.

^{37/} This UCS argument, and the underlying proposed findings, apply only to those non-condensable gases which could be produced from other sources, i.e., those non-condensibles not already present in the primary system, such as nitrogen in the core flood tanks or hydrogen produced following core damage. The Licensing Board found that voiding due to a small-break LOCA can interrupt reactor coolant system heat removal by natural circulation, but that such voiding does not preclude removal of reactor coolant system heat by either the boiler-condenser or feed-and-bleed cooling modes. I.D., ¶¶ 605, 607, 608.

^{38/} As we have noted, the Licensing Board explored the question and found that the Staff's methods for determining

(Continued next page)

UCS Exceptions 6 and 7 challenge the Licensing Board's findings on the reliability of boiler-condenser cooling. UCS Brief at 8, 9. UCS argues that this cooling mode is theoretical only because continued operation of the HPI pumps will refill the primary system and block the condensing surface. Id. at 8. Buried in the proposed findings cited by UCS is the citation to the testimony of Staff witness Jensen. In additional testimony not cited by UCS, however, Mr. Jensen stated that emergency feedwater enters the steam generator at a very high point which is close to the top of the tube sheet, so that even though the "still" water level on the secondary side could be below the primary level, there would still be a heat transfer surface available by the difference between the elevation of the emergency feedwater entry point and the level of the primary system. Tr. 4933-34 (Jensen). Further, the refilling of the primary system referred to by UCS occurs during the transition period discussed above, where the HPI flow is adequately cooling the core. UCS is therefore incorrect in implying that the boiler-condenser cooling mode would be ineffective. Rather, the core is being effectively cooled and the system is in a dynamic

(Continued)

which accidents fall within the category of "design basis" accidents are reasonable. See I.D., ¶ 1138. UCS has abandoned its exceptions on this issue by failing to brief them.

transition to the boiler-condenser mode which will be capable of removing heat from the primary system.

While the attempted point is mostly irrelevant to this appeal, the following statement in the UCS Brief, lifted from proposed findings below, again mischaracterizes the actual testimony given:

There are no plans to test the boiler-condenser mode on a B&W plant because there is no instrumentation available to control either the secondary or primary water levels accurately and the reactor might be damaged. (Tr. 4687-4688, Jones).

UCS Brief at 9. The following is the actual testimony given by Mr. Jones in answer to a question by UCS counsel Weiss:

Q So you are saying that you cannot safely perform this test at an operating reactor because they don't have the instrumentation to follow the core response properly?

A No. What I am saying is if you want to run a test of a boiler condenser mode, you would want to control system parameters to maximize the information obtained from such a test. It is senseless, in my opinion, to just run a test to show that a mode works, because there are other means that could be utilized to show the basic conceptual actions of the mode. And so what you would want to do is to control the secondary side level accurately, the primary side inventory accurately in the range of the steam generator tubes, and that type of instrumentation are not available on a nuclear power plant.

Tr. 4687-88 (Jones).

The Licensing Board acknowledged, but did not view as dispositive, the fact that the tests of this cooling mode did not duplicate the expected conditions following a small-break LOCA.^{39/} That Board found that the boiler-condenser mode is reliable, based upon testimony by the Staff and Licensee, and that the cross-examination conducted by UCS failed to elicit any evidence to the contrary. I.D., ¶ 621.

The issue of emergency feedwater reliability, raised here by UCS in its argument on the reliability of boiler-condenser cooling, is addressed below in response to UCS Exceptions 103, 104, and 107-109. See UCS Brief at 9. Suffice it to say here that the boiler-condenser mode does not require emergency feedwater. Main feedwater will do. See generally Keaten and Jones, ff. Tr. 4588. Consequently, a probability of failure of the EFW system is not a direct measure of the effectiveness of natural circulation or boiler-condenser cooling. In addition, the Staff estimates of EFW reliability cited by UCS are not based upon a mission success criterion of supporting natural circulation or boiler-condenser cooling, do not consider the probability of the initiating event, and among other limitations, do not

^{39/} Elsewhere, UCS dismisses a Licensing Board imposed test to demonstrate pressure control with the HPI system because such a one-time test performed under highly controlled conditions can do little but confirm the undisputed theoretical proposition. See UCS Brief at 25.

represent the probability of core damage occurring due to a lack of heat removal. See Wermeil and Curry, ff. Tr. 16,718, at 32-33, 39-40; Tr. 16,613-15 (Keaten), 17,080 (Wermeil), 16,748, 17,068, 17,095 (Curry).

UCS next launches the first of a series of arguments, found throughout the UCS Brief, challenging the Licensing Board's findings on feed-and-bleed cooling. See UCS Brief at 10-12. An initial point to be made is that feed-and-bleed cooling is not "central" to the resolution of UCS Contentions 1 and 2. It is not required except when postulating events beyond the plant design basis: for an extended loss of all main and emergency feedwater, or for certain accident conditions in conjunction with an extended loss of all feedwater.^{40/} Jones, ff. Tr. 4588, at 3; Tr. 5201 (Jones).

A second preliminary point to be made is that the only specific shortcoming of feed-and-bleed cooling alleged in UCS Contention 2 is an asserted inadequate capacity and radiation shielding for the storage of radioactive water bled from the primary coolant system. See I.D., ¶ 600. This allegation was not pursued in proposed findings below, or on appeal here.

^{40/} Licensee explains below, in response to the UCS exceptions on emergency feedwater reliability, its disagreement with the Licensing Board's conclusion that feed-and-bleed cooling is a necessary backup to emergency feedwater. See also I.D., ¶ 624.

UCS begins its argument with an attack upon reliance, which was never placed by the Licensing Board or by Licensee, on the Crystal River-3 event of February 26, 1980. See UCS Brief at 10, 11. Licensee witness Jones merely testified that the event demonstrated the operability of feed-and-bleed cooling. Jones, ff. Tr. 4588, at 4. His conclusions on the adequacy of that cooling mode rested upon other grounds as well, including analyses. See generally Jones, ff. Tr. 4588.

The UCS argument on operator actions during and following the achievement of feed-and-bleed cooling, UCS Brief at 11-12, ignores the substantial record on the matter which demonstrates the capability of the operators to perform the necessary actions successfully. See Keaten et al., ff. Tr. 16,552, at 10, 11. In addition, contrary to the UCS argument, UCS Brief at 11-12, there is evidence to support the Licensing Board's finding that the operators can receive guidance and training on these actions. See, e.g., Keaten et al., ff. Tr. 10,619, at 7-19 (procedures and training on inadequate core cooling).

UCS Exception 11 attempts to exploit, out of context, a Licensing Board statement from its decision on UCS Contention 3 (Pressurizer Heaters). See also UCS Brief at 11, 12. In that portion of its decision, the Licensing Board is discussing its reason for rejecting UCS Contention 3, explaining that, while the

Licensing Board agrees with the philosophy of reducing demands on safety systems, ". . . the feed and bleed mode has not been shown to be an unacceptable way of cooling the core, and the reactor coolant system pressure can be maintained by the HPI system." I.D., ¶ 756. The Licensing Board clearly was not shifting the burden of proof, and the partially quoted statement does not represent the Licensing Board's bottom line conclusion on feed-and-bleed cooling, which is explored in detail elsewhere. See Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Unit No. 2), ALAB-254, 8 A.E.C. 1184, 1190 (1975) ("We are not aware of any principle of law or common sense which would justify claiming as erroneous a few words in a finding which have been completely removed from their decisional and record context and are viewed in isolation.").

UCS Exception 15 -- on the use of letdown line during inadequate core cooling and the adequacy of radiation shielding outside containment -- is outside the scope of UCS Contentions 1 and 2, has nothing to do with feed-and-bleed cooling (discharging through the pressurizer safety or relief valves; the letdown line is not used in feed-and-bleed cooling, and UCS cites to no evidence that it is),^{41/} was not raised with the witnesses in

^{41/} The portions of Licensee Exhibit 51 referenced by UCS (Follow-up Actions 1.e and 1.g) do not apply to feed-and-bleed cooling. Rather, these actions apply only when main or emergency feedwater is available, after 50° subcooling has been achieved, and HPI flow has been throttled -- conditions not

(Continued next page)

cross-examination by UCS (Tr. 4739-62), and was not addressed in the UCS proposed findings to the Licensing Board.^{42/} See UCS Brief at 12, 13. Consequently, this entire argument by UCS is irrelevant and unreliable.^{43/}

Finally, there is no support in the record for the UCS argument that high-point vents are "essential," following a small-break LOCA, in order to vent steam bubbles and thereby reestablish natural circulation. See UCS Brief at 14. The requirement for high-point vents,^{44/} consistent with the NRC's

(Continued)

requiring feed-and-bleed cooling. Licensee Exhibit 51 at 3.0, 4.0. The procedure for feed-and-bleed cooling is set forth in Follow-up Action 2, beginning in Licensee Exhibit 51 at 5.0.

^{42/} Contrary to the citations in the UCS Brief, the matter was raised in UCS Reply Findings, when there was no further opportunity for other parties to respond.

^{43/} We note, however, that UCS erroneously claims the procedure to be deficient in calling for the use of the letdown line without a caution regarding its use under conditions of high radiation activity levels. The plant conditions under which the actions referred to by UCS would be taken do not assume that fuel failure has occurred, but that adequate core cooling has been established and that a plant cooldown will be performed according to applicable procedure. See Licensee Ex. 51 at 3.0. These procedures do address the restrictions on the use of the letdown line in the presence of high radiation levels. See, e.g., Licensee Ex. 45 at 8.0, and Licensee Ex. 47 at 7.0.

^{44/} Installation currently is scheduled for the end of the first scheduled outage beginning after July 1, 1982 and of sufficient duration to permit required modifications. 46 Fed. Reg. 58484 (1981).

"defense-in-depth" approach, is a back-up provided to mitigate a situation beyond the design basis which is not expected to occur in the future -- the generation of non-condensable gases. Tr. 4991-93 (Jensen).

G. Emergency Feedwater Reliability
(Exceptions 103, 104, 107-109)

No intervenor raised a contention below challenging the reliability of the Emergency Feedwater ("EFW") System at TMI-1.^{45/} UCS, which participated below with cross-examination and proposed findings, has briefed five exceptions to the results reached in the Licensing Board's decision on its own Board Question 6.

Licensee did not take exception to the Licensing Board's findings on the reliability of the TMI-1 EFW system because no significant conditions were added to the recommendations of the Staff in the Commission's Order and Notice of Hearing.^{46/} See I.D., ¶¶ 1066, 1067. Exceptions may not be filed unless a party is aggrieved by the result reached below.

^{45/} Analyses performed by Licensee and other investigatory groups have shown that the unavailability of EFW for a short period at the beginning of the TMI-2 accident had no significant effect on its outcome. Walsh and Toole, ff. Tr. 9840, at 2-4.

^{46/} Licensee does not oppose the additional requirement with respect to the steam generator rupture detection system. See I.D., ¶ 1064.

Toledo Edison Company, et al. (Davis-Besse Nuclear Power Station), ALAB-157, 6 A.E.C. 858 (1973).

In circumstances, however, where a party is satisfied with the result but, at the same time, does not subscribe to some of the findings contained in the initial decision, that party will be free to challenge any or all of those findings or conclusions in defending the result (should it be appealed by some other party which is seeking a different result), even though it would normally be precluded from taking an independent appeal. Consumers Power Company (Midland Plant, Units 1 and 2), ALAB-282, 2 N.R.C. 9, 10 (1975); Public Service Company of Oklahoma, et al. (Black Fox Station, Units 1 and 2), ALAB-573, 10 N.R.C. 775, 789 (1979).

While Licensee concurs in the Licensing Board's ultimate resolution of Board Question 6 on EFW reliability (i.e., that the short-term actions are necessary and sufficient for restart and that the plant, with the long-term actions, can be operated safely in the long term), we disagree with the Licensing Board's finding that ". . . the reliability of the EFW system has not been demonstrated to be adequate by itself." See I.D., ¶ 1050. Prior to addressing the UCS exceptions, Licensee will explain its disagreements with the Licensing Board's findings and the independent grounds upon which the Appeal Board should affirm the result reached.^{47/}

^{47/} The Appeal Board has the authority to make factual findings on the basis of record evidence which are different

(Continued next page)

The Licensing Board's conclusion, quoted above, appears to be based exclusively on a quantitative probabilistic analysis of the so-called "failure" on demand of the EFW system. While there are a number of reasons, which we will address, why that analysis is not valid, Licensee first takes issue with the Licensing Board's implicit rejection of the NRC's design criteria and the Staff's deterministic evaluation of the reliability of the TMI-1 EFW system. The Licensing Board virtually equates quantitative probabilistic analysis with a safety review. See I.D., ¶ 1044 ("We reject the implication of Licensee's argument that the lack of reliable data on the failure probability on demand of a safety system is adequate reason for refusing to inquire into the safety of that system.").^{48/}

There is no regulatory requirement in this agency that emergency (or auxiliary) feedwater systems (or entire decay heat

(Continued)

from those reached by the Licensing Board, and to issue supplemental findings of its own. Public Service Company of New Hampshire, et al. (Seabrook Station, Units 1 and 2), ALAB-422, 6 N.R.C. 33, 42 (1977), aff'd., CLI-78-1, 7 N.R.C. 1, 29 (1978).

^{48/} It was not Licensee's argument, or its implication, that the Licensing Board should not inquire into the reliability of the EFW system. Indeed, substantial evidence was presented by Licensee toward that end. It was our position, however, that the one should not assess a plant system on the basis of a quantitative analysis of unreliable and inapplicable data. See generally, Keaten, ff. Tr. 16,612.

removal systems) -- whether at TMI-1 or at other operating reactors -- must have their reliability estimated quantitatively; and there is yet no numerical standard against which they should be judged. The decisions in Florida Power and Light Company (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB-603, 12 N.R.C. 30 (1980), clarified by CLI-81-12, 13 N.R.C. 838 (1981), do not establish to the contrary.

The Licensing Board itself explored, as an issue independent of its concern with EFW reliability, the adequacy of Staff methodologies for determining design basis events and their significance to safety, including the comparative merits of the deterministic (or mechanistic) approach to regulation and quantitative probability analysis. See I.D., ¶¶ 1084-1116. The Licensing Board there encouraged the Staff to continue to incorporate probabilistic risk assessment techniques into its decision-making "whenever appropriate."^{49/} I.D., ¶ 1112. The Licensing Board concluded, however, that

They [Staff methods] depend upon a combination of deterministic and probabilistic assessments. Staff judgment plays an important role -- infallibility cannot be guaranteed. Nevertheless it is on that basis that we find that the Staff's method of determining that

^{49/} The Commission has issued a proposed policy statement on safety goals, which includes a provisional Plant Performance Guideline (likelihood of a nuclear reactor accident that results in a large-scale core melt should normally be less than one in 10,000 (10 to the minus 4) per reactor year of operation). See 47 Fed. Reg. 7023, 7026 (February 17, 1982).

all of the necessary TMI-2 accident-related recommendations have been identified is sufficient to provide reasonable assurance that TMI-1 can be operated in the short and long term without endangering the health and safety of the public.

I.D., ¶ 1138.

In its assessment of the reliability of the TMI-1 EFW system, the Licensing Board does not appear to have given significant weight to the Staff's deterministic evaluation (in combination with probabilistic methods). Further, the Licensing Board erred in its apparent determination that a probabilistic approach here was "appropriate."

Licensee does not in any way dismiss the utility of probabilistic risk assessment. Prior to the Staff's reliability evaluation prepared in response to Board Question 6, an evaluation of the reliability of the TMI-1 EFW system as it existed in mid-1979 had been performed in 1979 for Licensee by Babcock & Wilcox. Licensee Ex. 15 at 9. The B&W analysis considered the same transients the Staff subsequently considered, but also considered reliability for the time periods 5, 15 and 30 minutes. The Staff testified that because of the more detailed design and operational information used by B&W for its analysis, that analysis was necessarily more rigorous and more detailed than the conservative type of analysis performed by the Staff as a check. Wermeil and Curry, ff. Tr. 16,718, at 36; Tr. 17,022-23 (Curry). While the B&W analysis was not intended to establish a numerical

reliability value for the TMI-1 EFW system, it did compare the 1979 system with those at Westinghouse and Combustion Engineering plants and found that the TMI-1 system fell in the mid-range.^{50/} Tr. 5948, 5984-85 (Capodanno); Tr. 6157-59 (Wermeil). The Staff reviewed this study and approved its methodology and results. Wermeil and Curry, ff. Tr. 16,718, at 5.

Licensee believes that both of these probabilistic risk assessments (B&W's and the Staff's) were valuable and accomplished their intended purpose, which is:

the assessment of the reliability of a given auxiliary feedwater system compared to other designs and the identification of major contributors to a given auxiliary feedwater system unreliability so that system upgrading can be most effectively undertaken, if desired.

Wermeil and Curry, ff. Tr. 16,718, at 39; Tr. 6134-35 (Wermeil). In fact, the 1979 B&W analysis identified the major contributors to TMI-1 EFW system unavailability, and led directly to several of the restart modifications to the system design and to plant procedures. See Licensee Ex. 15 at 8, 10; Wermeil, et al., ff. Tr. 6035, at 10; Wermeil and Curry, ff. Tr. 16,718, at 4, 5.

^{50/} It should be noted that the original B&W analysis and the Staff review of it assumed that both electric-driven pumps were required for successful EFW system operation. Later analysis, however, indicates that only one electric driven EFW pump is needed for successful heat removal. Wermeil and Curry, ff. Tr. 16,718, at 38.

Prior to the B&W analysis, Licensee itself performed a reevaluation of the TMI-1 EFW system design and operation in order to determine where upgrades in the timeliness and reliability of the system could be made. This evaluation resulted in eight items that the Staff agreed would result in improvement to the EFW system reliability, and that were subsequently included in short-term action 1(a) of the Commission's Order and Notice of Hearing. Wermeil and Curry, ff. Tr. 16,718, at 3. Subsequent to the B&W study, four additional short-term recommendations were developed based on the Lessons Learned Task Force review and the Bulletins and Orders Task Force review of B&W operating plants. Id. at 5. As a final approach to reexamining the reliability of EFW systems in operating plants, the Bulletins and Orders Task Force performed a comparison of the EFW system designs against the current Standard Review Plan criteria for a safety-grade system in order to provide further insight into possible areas for improvement that were not identified in previous evaluations. The EFW system review effort was later consolidated into the NRC TMI Action Plan. Id. at 11.

Staff witness Wermeil provided the Licensing Board with a detailed discussion of the evolution of the Staff's criteria related to the EFW system, and of the manner in which system reliability has been improved as a result of implementation of these criteria at TMI-1. See generally Wermeil and Curry, ff.

Tr. 16,718, at 1-30; Tr. 16,719 (Wermeil). The EFW system review effort since the TMI-2 accident is substantially more detailed and exhaustive than the Staff's standard deterministic evaluation against the acceptance criteria of the Standard Review Plan. Based upon its review and evaluation of the requirements and of Licensee's compliance with them in terms of the resulting hardware, procedural and technical specification changes to be implemented, the Staff has concluded that the TMI-1 emergency feedwater system meets the requirements identified for implementation at the time of restart, and that with these changes the system will be sufficiently reliable to allow restart. Wermeil and Curry, ff. Tr. 16,718, at 12; Tr. 17,017 (Wermeil).

The Licensing Board found that "[t]he EFW system will be safety grade at restart for small break LOCA and MFW transients, the ones of concern to this Board." I.D., ¶ 1057. Consequently, Licensee must raise the question as to why compliance with all of this agency's design requirements is not adequate support for a finding that the TMI-1 EFW system is reliable. The Commission itself has recently stated, in the Proposed Policy Statement on Safety Goals for Nuclear Power Plants, that ". . . because of the present limitations in the state of the art of quantitatively estimating risks, the numerical guidelines are not substitutes for existing regulations." 47 Fed. Reg. at 7024 (1982). The Licensing Board has ignored these agency standards without good cause for doing so.

The Licensing Board apparently was inspired in part by the Appeal Board's decision in the St. Lucie case, ALAB-603, supra. The Appeal Board embarked upon its consideration of quantitative assessments of the reliability of the electric power systems at St. Lucie because the underlying evidentiary record with respect to that plant revealed certain unique circumstances: (1) that the peninsular shape of Florida limited the utility's ability to interconnect its system with those of other utilities such that off-site power might be less assured than for utilities interconnected with multiple grids; and (2) actual operating experience which tended to confirm that this is the case. ALAB-603, supra, 12 N.R.C. at 31-34.

Unlike the situation at St. Lucie, there is no disturbing operating history at TMI-1 to warrant unique consideration. To the contrary, there have been no failures of the TMI-1 EFW system on demand, and there have been no total loss of main feedwater events (other than required tests) which would challenge the system. Keaten, ff. Tr. 16,612, at 11. The historical data indicates that the TMI-1 EFW system has been more reliable than the average. Tr. 6219 (Wermeil).

To the extent that the Licensing Board believed that B&W plants are more sensitive because of the once-through steam generator design and experience an unusually high challenge rate (see Tr. 6150, 6175, 6179-80), this view was in error.

Uncontradicted Staff testimony based on a Staff survey showed that the arrival rate of feedwater transients is not dependent upon the NSSS design -- i.e., B&W plants are no more likely to have a feedwater transient than Westinghouse or Combustion Engineering plants. Tr. 15,769-70 (D. Ross).

The EFW challenge rate of 0.3 per year, adopted by the Licensing Board (I.D., ¶ 1040), is not Licensee's number for TMI-1, but for five B&W plants. Keaten, ff. Tr. 16,612, at 9. The design of EFW systems is not a B&W responsibility, and the designs of these systems may vary widely. Id. at 5, 6. The unavailability of the TMI-1 emergency feedwater system was zero for five years of operation. Koppe, ff. Tr. 13,335, at 41. TMI-1 has not experienced a loss of main feedwater transient, or a total loss of feedwater, during its operating history. Keaten, ff. Tr. 16,612, at 9; Tr. 6175-76 (Wermeil).

The basis for the Licensing Board's postulation that the probability of failure of an EFW system is 1 in 25 per reactor-year was testimony by NRC Staff witness Lantz, during cross-examination, that Licensee Event Reports indicate 8 failures of safety-grade EFW systems in 200 reactor-years. Tr. 6093-94 (Lantz). See I.D., ¶ 1041. The data, however, is not applicable to TMI-1. Four of the eight failures reported by Mr. Lantz involved normal start-up operation. Tr. 6095-96 (Lantz). In contrast, the EFW system at TMI-1 is not normally

used for plant startup or shutdown. The data also includes failures of associated systems which are not found at TMI-1. Keaten, ff. Tr. 16,612, at 10; Tr. 6136-67 (Wermeil).

Thus, the Licensing Board erred in concluding from some industry-wide data that a problem exists at TMI-1, and it compounded that error by using this data in its own quantitative analysis of TMI-1 EFW system reliability. See I.D., ¶ 1042. Just as EFW system demand frequency is a function of plant specific factors, EFW system availability and operation upon demand are dependent upon plant specific EFW components, EFW support services, component and system testing, and maintenance. Keaten, ff. Tr. 16,612, at 10. Licensee again notes the Staff testimony that the historical data would indicate the TMI-1 EFW system to be more reliable than the average. Tr. 6219 (Wermeil).

Moreover, the Licensing Board's data is not only generic and therefore inapplicable, it is also historical and does not reflect the improvements made not only to the TMI-1 EFW system, but to all operating reactors under the NRC's TMI Action Plan. These are sound technical reasons why the Licensing Board should have avoided what the Appeal Board in St. Lucie wisely avoided -- applying only generic failure or availability experience. The absence of a statistically meaningful operating data base at TMI-1 is no justification for blindly applying inappropriate data from other plants.

The NRC has used principally deterministic criteria, supplemented by elements of probabilistic analysis, in licensing nuclear power plants and in judging the acceptability of a plant system. Rosenthal and Check, ff. Tr. 11,158, at 17-18, 20-26; Tr. 11,200-02 (Check, Rosenthal); Tr. 11,253 (Check). The Licensing Board acknowledged early on that use of a probabilistic analysis in conjunction with some numerical acceptance criterion, in answer to Board Question 6, would not be necessary in the absence of a special situation. Tr. 6178-88 (Administrative Judge Jordan). There is no special situation with the emergency feedwater system at TMI-1 -- either in terms of the rate of challenge to the system or in terms of the likelihood that it will fail.^{51/} See Keaten, ff. Tr. 16,612, at 11.

Directly in response to the Licensing Board's requests, Tr. 16,740 (Curry), the Staff nevertheless presented evidence on a quantitative estimate of EFW system reliability at TMI-1. See Wermeil and Curry, ff. Tr. 16,718, at 31-42; Tr. 16,732-34 (Curry). At the same time, the Staff witness candidly acknowledged the serious limitations on the exercise he had performed, and warned the Licensing Board of the danger in misusing, or placing too much reliance upon, his results.

^{51/} At TMI-1, the Licensing Board found that EFW system reliability at restart will be comparable with some other operating plants. Indeed, it is not inconsistent with the industry average estimate based on a Licensee Event Report survey. I.D., ¶ 1057.

The analysis was conducted to estimate the reliability of the EFW system in a five-minute period after the occurrence of the transient, and mission success was defined as delivery of required EFW flow to the steam generator(s) within five minutes. The Staff chose a five-minute time period because of the estimated time for steam generator dryout in a B&W plant if no feedwater is provided. The Staff believes that, in terms of plant operation, steam generator dryout is significant due to the unstable system condition it induces. Wermeil and Curry, ff. Tr. 16,718, at 32, 33. The Staff also acknowledged that it chose this success criterion (i.e., avoidance of steam generator dryout) in order to make the study consistent with those for other PWRs, even though it is a slightly more severe criterion for B&W plants. Tr. 17,068 (Curry). Licensee points out, however, that the absence of EFW flow for five minutes does not result in core damage, and that the significance of dryout at B&W plants is not necessarily the same as for other plants since EFW is sprayed into the steam generator at a very high point and immediately starts to cool the primary system when it is reestablished. Tr. 16,613-15 (Keaten).

A major implication of the reliability estimate for a five-minute period is that the number and type of operator actions that may be expected to be accomplished to rectify an EFW system fault is very limited. Consequently, system reliability

becomes largely a function of the probability of the system being in the proper configuration at the time of demand, and the inherent reliability of mechanical and electrical components to function on demand. Wermeil and Curry, ff. Tr. 16,718, at 33. This analysis really just characterizes the EFW system's innate reliability as a function of its hardware reliability. It does not recognize (or gives essentially no credit for) improved operating procedures and operator training. Tr. 16,744-46 (Curry); Tr. 16,700-02 (Keaten). Neither does it credit the hardware changes made at TMI-1 to facilitate operator action to recover feedwater. Tr. 17,016 (Curry). As a general rule, the Staff believes that consideration of operator recovery actions would certainly improve the reliability. Tr. 16,940 (Curry). While the Licensing Board recognized these limitations, I.D., ¶ 1047, we do not believe that it appreciated their significance.

In addition, because of the smaller inventory of B&W steam generators, dryout would occur much sooner if all feedwater were lost than would occur under similar circumstances for a Westinghouse steam generator. This results in a more stringent response requirement for an emergency feedwater system associated with a B&W NSSS than one associated with a Westinghouse NSSS because significantly less reliance on operator intervention to rectify system faults can be credited for the B&W response than the Westinghouse. Thus, again, the selection of steam generator

dryout prevention as the benchmark for successful EFW system operation influenced the analysis, and places some bias against the B&W design. Wermeil and Curry, ff. Tr. 16,718, at 41; Tr. 16,741, 17,075-76 (Curry).

A Staff witness testified that if the Staff had used a more realistic mission success criterion--such as the capability of the EFW system to deliver minimum feedwater flow for mitigating a transient--the potential bias associated with the criterion could have been corrected. He expressed confidence that if the Staff had used this sounder basis for comparison, the upgraded TMI-1 EFW system would have looked very similar to the Westinghouse plants. Tr. 17,080 (Wermeil). Accord, Tr. 17,068, 17,095 (Curry).

Another important limitation on the Staff's analysis is that it represents a rough assessment of the potential of the EFW system to accomplish a given mission under given conditions. See Wermeil and Curry, ff. Tr. 16,718, at 39. There is not necessarily a perfect correlation between the comparative reliabilities of various plant auxiliary systems and the comparative risk associated with the operation of those plants. To draw conclusions about the comparative risks of operating various nuclear plants, consideration needs to be given to the integrated response of all plant systems to cope with potential transients and loss-of-coolant accidents. Id. at 39, 40; Tr. 16,722

(Curry). See, e.g., Tr. 16,748 (Curry) (analysis does not represent overall probability of core damage); Tr. 17,079 (Curry) (plant risk should take into account not only the fact that successful EFW system operation will occur even if flow is secured much later than five minutes, but also the fact that TMI-1 is equipped with a feed-and-bleed mode of operation which can successfully cool the core).

Nevertheless, the Staff witness expressed his judgment that with the EFW reliability estimate he presented, and based upon his knowledge of the additional system reliabilities to be considered in a sequence that would lead to core damage and his familiarity with reliability analyses of other plants, the probability of core damage at TMI-1 is less than or certainly no greater than in all other operating plants, and that it is not inconsistent with the numerical safety goals now under consideration by the Commission. Tr. 17,089-92 (Curry).

There is no special circumstance here which would warrant the Licensing Board's resort to an unreliable numerical reliability estimate in the case of TMI-1. There is no basic difference between B&W plants and other PWRs in protecting against a loss of main feedwater transient, Tr. 17,064 (Wermeil), and operating history shows that the arrival rate for feedwater transients does not depend upon the NSSS design. Tr. 15,769 (D. Ross). That is, B&W plants are no more prone to have feedwater

transients than are other PWRs. Tr. 15,770 (D. Ross). Further, there is no reason to suspect that EFW systems at B&W plants are less reliable than at other plants. Tr. 16,687-88 (Keaten); Tr. 17,068-69 (Curry). Yet, many other PWRs do not have the back-up feed-and-bleed cooling capability which exists at TMI-1. Tr. 17,064 (Wermeil).

While Licensee supports the Licensing Board's finding that feed-and-bleed cooling is highly reliable,^{52/} I.D., ¶¶ 1051, 1052, it is not required at TMI-1 in order to support a decision that the plant is safe to operate. Feed-and-bleed cooling is only required for events beyond the plant design basis. See Jones, ff. Tr. 4588, at 3.

In its argument challenging the Licensing Board's findings on the reliability of feed-and-bleed cooling, UCS relies upon extra-record material in the form of an enclosure to SECY-81-513, "Plan for Early Resolution of Safety Issues." UCS Brief at 107, 108. This paper addresses the determination of priorities for tackling safety issues. The document can only be

^{52/} The only action required of the PORV and safety valves in feed-and-bleed cooling is that one or more of these valves open to provide a fluid discharge path. The individual systems and components required for feed-and-bleed cooling are routinely operated and/or tested to assure their functionability. Jones (on Board Questions 6.e and 6.f), ff. Tr. 4588, at 1-2, 4. In addition, the operator actions required are not complex. The Licensing Board correctly found that feed-and-bleed operation is adequately reliable to perform its potential function. See id. at 3; Tr. 4778-79 (Jones).

read to state that no analysis has been performed of feed-and-bleed cooling for the Davis-Besse configuration, and not for others, including TMI-1.

UCS argues that the Licensing Board erred in finding that automatic initiation of the EFW system will be safety grade at restart since the ICS is involved with the EFW flow control valves. UCS Brief at 104, 105. The Licensing Board recognized, however, that control will not be totally safety grade by restart, while automatic initiation will be. See I.D., ¶ 1036. See also I.D., ¶ 1031 (manual control of EFW control valves independent of ICS).

UCS asserts that the Licensing Board erred in requiring a long-term solution to a potential main steam rupture detection system isolation of feedwater flow. UCS Brief at 105. Based upon the provision in the TMI-1 control room, prior to restart, of safety-grade, redundant indication of EFW flow to each steam generator, it is not necessary to modify the detection system prior to restart. See I.D., ¶ 1029.

UCS takes the fact that the TMI-1 EFW system can adequately remove decay heat with only one motor-drive EFW pump (a loss of both the turbine-driven and one motor-drive pump), a situation beyond the single failure criterion, and argues that a NUREG-0578 "requirement" is not met because a relief valve might lift. See UCS Brief at 108, 109; Keaten et al., ff. Tr. 16,552,

at 7; Capodanno et al., ff. Tr. 5642, at 8, 9. There is no evidence, however, that the NUREG-0578 recommendation contemplates multiple failures.

Finally, UCS asserts that the Licensing Board also should have considered the probability of successfully removing heat from the steam generators. UCS Brief at 109, 110. This undoubtedly is because the condenser, atmospheric dump valves, and numerous main steam safety valves provide so many release paths that the numerical contribution would be inconsequential. See generally, Keaten et al., ff. Tr. 16,552; I.D., ¶ 1024.

H. Safety System Bypass and Override
(Exceptions 46-56)

As the Licensing Board correctly observed:

During the TMI-2 accident, the operators prevented a safety system which had been automatically initiated from performing its safety function by terminating full flow from the high pressure injection system to the reactor coolant system. This reduction in emergency cooling water flow significantly contributed to the severity of the TMI-2 accident. Pollard, ff. Tr. 6410, at 10-1. Intervenors UCS and Sholly suggest different ways to correct this concern regarding manual bypassing of safety systems. UCS, in its Contention 10, suggests the modification of the design of these systems "so that no operator action can prevent the completion of a safety function once initiated." Mr. Sholly, on the other hand, proposes in his Contention 3 that the plant operating procedures governing ECCS should be modified prior to plant

restart to avoid operator defeat of the ECCS.

I.D., ¶ 724.

Before addressing the Licensing Board's decision against UCS Contention 10, it is important to note that Board's finding that the concerns raised in Sholly Contention 3 have already been satisfied at TMI-1. The Licensing Board found that the operators at TMI-1 have been provided with specific instructions as to when it is necessary or allowable to intervene and override the automatic operation of the emergency core cooling, containment isolation, and emergency feedwater systems, and that the operators have been trained on these requirements. I.D., ¶ 747. This is the appropriate response to the lesson learned at TMI-2.^{53/}

In its brief, UCS paints a somewhat distorted picture of its own contention in an attempt -- begun at the proposed findings stage -- belatedly to alter the matter in controversy and disown a clearly losing position. UCS asserts that its

^{53/} For example, the TMI-1 plant emergency procedure for loss of reactor coolant causing high pressure injection requires that upon automatic initiation of HPI all reactor coolant pumps are tripped and HPI shall not be terminated unless: (1) the low pressure injection system is in operation, flow is at a rate in excess of 1000 gpm in each line, and the situation has been stable for 20 minutes; or (2) the degree of subcooling is at least 50°F (as determined by the saturation meter or the five highest in-core thermocouple readings) and the action is necessary to prevent pressurizer level from going off scale high. If 50°F subcooling cannot be maintained, the procedure requires that full HPI shall be reinitiated. Licensee Ex. 48 at 2, 8.

. . . testimony generally was to the effect that the accident graphically demonstrated the unacceptable consequences of permitting the operator to interfere with the functioning of safety systems and that a clear lesson of the accident is that the plant design should be modified to preclude such intervention until the conditions specified in the plant's design basis for termination of safety systems has been achieved.

UCS Brief at 65.

The actual contention (see I.D., ¶ 722) clearly asserts only one basis: that the TMI-1 design violates a Commission regulation and therefore must be modified. At best, the contention admitted by the Licensing Board can be read as citing the TMI-2 accident as an example of the alleged design violation of a Commission regulation -- which violation UCS witness Pollard asserts exists at every licensed operating reactor in the United States.^{54/} See Tr. 6470 (Pollard).

The great bulk of the UCS direct testimony in support of its Contention 10 is devoted to an attempt to prove that the TMI-1 design violates IEEE Standards 279 and/or 603. Only passing attention is paid to the "lessons learned" from the TMI-2 accident. Most of the redirect examination of UCS witness

^{54/} UCS also attempted below to broaden the legal standard raised in its contention to include General Design Criterion 20. See UCS Brief at 66. When UCS announces that it "limited" the contention, id. at 65, it should be noted that the cited testimony by Mr. Pollard was given after Licensee's witnesses were excused and after Licensee had completed its cross-examination of Mr. Pollard.

Pollard (Tr. 6570-76) was directed at an interpretation of IEEE 279, as were five UCS exhibits (13-17). At the request of UCS (Tr. 6660-66), Mr. Pollard was permitted to resume the stand, following the appearance of the Staff witness, to testify further concerning the IEEE standards. See Tr. 6720-88. It is, then, at best ironic that UCS calls into question here the Licensing Board's expenditure of "a good deal of time on the question of the interpretation of IEEE Std. 279." See UCS Brief at 66. The Licensing Board, of course, simply was confronting the contention as it was pleaded and presented by UCS.

Indeed, UCS has carried to this Appeal Board four exceptions (46-48, and 54) to the Licensing Board's findings on the IEEE standards, even though UCS has not challenged the Licensing Board's holdings that the Commission regulation incorporating IEEE Std. 279, 10 C.F.R. § 50.55a(h), does not apply to TMI-1, I.D., ¶¶ 726, 745, and that draft IEEE Std. 603 has no regulatory force within the NRC, I.D., ¶ 734. See UCS Brief at 67-69. Further, UCS concedes that a literal reading of IEEE Std. 279 does not comport with the UCS contention. See UCS Brief at 67. No more is required to reject the UCS contention (and these four exceptions) that the TMI-1 design violates a Commission regulation.

Nevertheless, the record includes evidence on what UCS asserts is the violated "purpose" of IEEE Std. 279. UCS asserts

that the Staff and Licensee view of the standard would defeat that purpose. UCS Brief at 68. The Licensing Board explicitly rejected the UCS view of the standard's purpose. See I.D., ¶ 732. Licensee witness Patterson explained the legitimate purpose of the relevant section (4.16) of IEEE Std. 279.^{55/} The concern addressed by the requirement arose from historical experience which showed that protection systems could cause reactor trips, followed by a sudden clearing of the situation which left the plant in an undefined state from the operators' viewpoint. The purpose of the requirement, then, was to force the designer to incorporate a latching or reset mechanism in a protection system so that the operator would have to take action to reset the system and the system would not be capable of going back to an unset state of its own accord. Tr. 6228 (Patterson). Staff witness Sullivan, who agrees with Licensee's interpretation of the standard, testified that the purpose of the standard is to govern design capability, and not the operational issue of completion of a safety function. The purpose of the standard,

^{55/} Mr. Patterson was a member of the IEEE Nuclear Science Group Standards Committee during the preparation of IEEE 279-1968, and a member of the Joint Committee on Nuclear Power Standards of the IEEE Group on Nuclear Science and the IEEE Power Engineering Society during the preparation and approval of IEEE 279-1971. Statement of professional qualifications, E. S. Patterson, attached to Clark et al., ff. Tr. 6225; Licensee Ex. 16 at 3. UCS witness Pollard, on the other hand, began his service on IEEE standards committees after the publication of IEEE 279-1971. Tr. 6498-99 (Pollard).

then, is not inconsistent with operator intervention. Tr. 6605-06 (Sullivan).^{56/} See I.D., ¶ 729.

In addition, the Licensing Board entertained UCS testimony on draft IEEE Std. 603. The Licensing Board's fully considered, detailed and correct treatment of these UCS arguments is set forth in the Partial Initial Decision. See I.D., ¶¶ 733-739. On appeal, UCS simply repeats itself without pointing up any error in the Licensing Board's analysis. See UCS Brief at 68, 69.

The Licensing Board also considered evidence on the merits of the proposed UCS design modification. In spite of the UCS assertion that the Licensing Board failed to confront the UCS evidence on this point (UCS Brief at 70), Mr. Pollard's testimony and UCS proposed findings of fact are quoted and discussed by the Licensing Board. See I.D., ¶¶ 740, 742. Based upon the reasons set forth in the testimony of Licensee and the Staff, however, which is also discussed, the Licensing Board disagreed with the UCS view. See I.D., ¶¶ 741-745.

^{56/} Mr. Sullivan is the NRC member of the IEEE Nuclear Power Engineering Committee, and participates in the Committee's development of standards for nuclear power plants. Professional Qualifications, Donald F. Sullivan, attached to Sullivan, ff. Tr. 6602. Mr. Sullivan began his work with IEEE standards committees in March, 1966, and has been continuously involved with the committees' work since then, including the development of IEEE Std. 279. Tr. 6675-76 (Sullivan); UCS Ex. 16 at Foreward; Licensee Ex. 16 at 3.

UCS suggests here, as it did below before the Licensing Board, that its design modification could be accomplished with relatively minor circuit modifications, and without adding major complexity to the plant. UCS Brief at 65, 71. There is no evidence, however, that the UCS witness has seriously examined the design requirements for an interlock system for the emergency core cooling, containment isolation and emergency feedwater systems. For example, at the hearing the UCS witness testified that he would add an automatic protection system, on top of the automatic interlock system he proposes, to stop an interlocked safety system operation itself from going too far (failing) and causing damage to the plant. Tr. 6435 (Pollard). It is clear that Mr. Pollard has given inadequate attention to the potential failure modes and effects of automatic interlock systems. See Tr. 6534-37, 6561-67, 6582-84. Further, in reciting Licensee's position on the disadvantages of modifying the TMI-1 design as UCS proposes,^{57/} UCS Brief at 71-72, UCS omits Licensee's

^{57/} UCS attacks the testimony of Licensee witness Clark on the disadvantages of an interlock system. UCS Brief at 71. The testimony cited does not support the finding that Mr. Clark postulated an unnecessarily complex circuit to define plant stability or that he was unaware of the intended interpretation of the emergency procedures. Further, given his role as a very senior officer of GPU Nuclear Corporation and the content of the direct testimony he presented, there is no reason why Mr. Clark should be intimately familiar with the design of the saturation meter circuits or which control room indications are safety-grade. Of course, UCS chose not to ask these questions of the other witnesses on Licensee's panel -- the TMI-1 Supervisor of Operations (M. Ross) and an instrumentation and control design engineer from B&W (Patterson).

position that the addition of interlocking systems would also introduce new failure modes, an increased potential for failures, and uncertain failure consequences. See Tr. 6237 (Clark).

In this regard, UCS seriously misrepresents the record when it argues here that no one was able to postulate an example of a situation where any conceivable hazard to the public could result from the design suggested by UCS. See UCS Brief at 66, 72. A fair reading of the record is that no one postulated an example where operator intervention in the safety system operation must occur prior to meeting the plant conditions for terminating safety systems. It should be apparent, however, that the UCS design could result in hazard to the public if it fails and operation of the emergency core cooling system or the emergency feedwater system is not terminated prior to plant damage. See, e.g., Pollard, ff. Tr. 6410, at 10-22, 23.

In its brief, UCS cites to testimony presented on March 18, 1982, in a preliminary hearing before the Licensing Board, even though UCS acknowledges that the testimony, presented as at a deposition, had not yet been made a part of the evidentiary record. See UCS Brief at 71, 72; Licensing Board Memorandum and Order Setting Preliminary Hearing, March 2, 1982, at 5-6 ("The transcript of the preliminary hearing will not itself be a part of the evidentiary record unless it is later made part of the evidentiary record by a specific order"). Since the UCS Brief

was filed, the Licensing Board has denied the UCS motion to reopen the record, so that the testimony will not be made part of the record. See Licensing Board Memorandum and Order Denying Motions to Reopen Record, April 26, 1982.^{58/} The appeal at hand is to be decided on the basis of the Licensing Board record. Duke Power Company (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 N.R.C. _____ (March 30, 1982), slip op. at 53.

UCS suggests here, as it did to the Licensing Board in proposed findings, that there should be a balancing of the two alternatives (the UCS proposed concept of a design modification versus the current design at all operating reactors) by considering the probabilities of unforeseen events and appropriate operator response.^{59/} See UCS Brief at 73, 74. While UCS did not so propose, presumably one would also consider the probabilities associated with events initiated by failures of the UCS interlock and control systems, and with failures of such systems when called upon to operate by other events.

^{58/} In any case, the Martin Team merely recommended that its idea for a lock-in feature be evaluated for appropriateness. Tr. 27,141 (Hunter); see also Tr. 27,055-58 (R. Martin). It certainly was evaluated in this proceeding.

^{59/} UCS misrepresents the testimony of Licensee witness Clark when it states that "he was unwilling to even agree that the probability of an unforeseen accident sequence was lower than the probability of a design basis accident." UCS Brief at 74. Mr. Clark stated that he would agree with that proposition for any given unforeseen event, but that he could not agree for the generic class of unforeseen events. Tr. 6255 (Clark).

While UCS witness Pollard was willing to speculate on the probabilities of unforeseen events, he presented no substantive basis for his views. Even if the Licensing Board had been inclined to undertake this exercise, there was not a reliable record upon which to compare quantitative or qualitative ranges of probabilities. There is one important point, however, which UCS does not address. No matter what the probabilities are, the UCS proposal could result in an irreversible path to destruction if the interlock system fails, whereas the current designs would at least allow operators a chance to correct the situation.

In opposition to systems which automatically lock out the operator, Licensee noted that it has always been recognized that it would be impossible to construct a plant which would automatically operate correctly under all conditions, and that a properly trained operator in control of the plant is the best continuing guarantee of correct operation. This is particularly true, Licensee asserts, since it is impossible to foresee every possible condition which could arise. The operator, when properly prepared for his task, is infinitely more flexible in responding to unexpected situations than any possible automatic control mechanisms. Clark et al., ff. Tr. 6225, at 5 (Clark); Tr. 6235-38 (Clark).

The Staff, which takes the same position as Licensee, does not generally require the designs of engineered safety

feature systems to be such that the operator cannot interrupt the safety function at any time subsequent to initiation. One reason is that the safety advantages of an ESF safety function that cannot be prevented by the operator from going to completion must be weighed against the potentially adverse effects on safety that could, under certain circumstances, result from continued operation of the system. Sullivan, ff. Tr. 6602, at 5. Staff witness Sullivan further testified:

Fully automatic safety systems might in theory be designed which neither permit nor require operator intervention. But to do so would require the determination, a priori, of all possible accident sequences to ensure that operational requirements placed on these systems are adequate. We consider it unlikely that this objective could be achieved and, therefore, such systems would be susceptible to misoperations during events which might not have been postulated. On balance, the staff believes that it is prudent to rely on a well trained operator, provided with adequate information, to function as an integral element of a response to an emergency.

Id.; Tr. 6624 (Sullivan).

Licensee witness Clark reached the heart of this part of the dispute when he testified that it is just as impossible to foresee all possible sequences of events and reduce them to operating procedures as it is to foresee all possible sequences of events and reduce them to automatic circuitry. Tr. 6246-47 (Clark). The operator, however, may adjust and respond appropriately to the new condition. As Staff witness Sullivan put it,

consideration of the potential for unforeseen events is not speculation, it is engineering foresight. Tr. 6642, 46 (Sullivan).

UCS presents not one word of argument in support of its Exception 52. There is only a reference to eleven UCS proposed findings. While the exception properly could be dismissed for the reasons set forth above (supra, at 3-6), we note that the UCS position described in the exception is properly stated by the Licensing Board. See I.D., ¶ 738.

Finally, the UCS argument in support of its Exception 53 illustrates the danger of relying upon proposed findings instead of citations to the evidentiary record itself. UCS cites its own Proposed Finding 262 for the proposition that TMI post-accident training and requalification do not engender confidence that the operators can be relied upon to react appropriately under a range of accident conditions. UCS Brief at 75. The UCS proposed finding itself contains no citations to the record, but relies exclusively on proposed findings by the Commonwealth of Pennsylvania which subsequently were withdrawn by the Commonwealth.

Further, the Licensing Board's decision clearly does not conclude that "the analyses, procedures and training required to significantly improve operator performance during transients and accidents have not yet been provided." See UCS Brief at 75.

I. Equipment Qualification
(Exceptions 57-64)

UCS begins its argument in support of exceptions to the Licensing Board's decision on Board Question/UCS Contention 12 with the statement that UCS did not abandon its Contention 12. UCS Brief at 76. UCS did not simply move the Licensing Board to pursue the contention. See id. UCS at the same time withdrew it. Licensee is not aware of any supportable legal grounds upon which UCS could have appealed a Licensing Board determination not to pursue the matter.^{60/} Consequently, the issue was addressed only because the Licensing Board exercised its discretion and elected to explore it. Licensee raises this status question not because it is dispositive of the appeal, but because it provides at least some perspective for UCS arguments here about findings to which it is "entitled." See UCS Brief at 84.

It is important to recognize at the outset that the issue of environmental qualification of safety-related electrical equipment is being addressed by the NRC outside of this TMI-1 restart proceeding. Equipment qualification per se was not the subject of the short- or long-term actions recommended by the

^{60/} To argue otherwise would be to hold that intervenors have a right to withdraw a contention, in the face of no obligation to present direct evidence in support of it, in order to conscript a licensing board into at least the appearance of sharing the intervenor's concern by sponsoring a board question on the matter.

Director of Nuclear Reactor Regulation and specified by the Commission in its Order and Notice of Hearing.^{61/} See, in this docket, CLI-79-8, 10 N.R.C. 141, 144-145 (1979). Presumably, then, UCS Contention 12 was admitted for litigation in the first place as a challenge to the sufficiency of the Staff's recommendations, in that they did not encompass a requirement for demonstrating anew the qualification of safety-related equipment.

When the Licensing Board admitted and limited the contention to "equipment important to safety in the containment building and auxiliary building," it held that ". . . the contention is too broad in that its reference to GDC-4 would extend to structures, systems, and components without further limitation." First Prehearing Conference Order, LBP-79-34, 10 N.R.C. 828, 837 (1979). The issue was also limited, we submit, by the Licensing Board's general ruling that the scope of the proceeding is governed by the Commission's Order and Notice of Hearing and contentions having a reasonable nexus to the TMI-2 accident. See I.D., ¶ 24, LBP-81-32, 14 N.R.C. 381, 394 (1981).

The record shows that the only known environmental condition to which certain safety-related equipment at TMI-2 was exposed which was beyond that for which it was qualified was submergence due to flooding. Braulke-1,^{62/} ff. Tr. 6820, at 4,

^{61/} This includes the recommendations of the TMI-2 Lessons Learned Task Force set forth in NUREG-0578 and incorporated by reference into the Order and Notice of Hearing.

^{62/} Excerpts from Licensee's Testimony of Robert W. Keaten, George R. Braulke and George J. Brazill in Response to UCS

(Continued next page)

6; Braulke-2,^{63/} ff. Tr. 6820, at 1; Rosztoczy-2,^{64/} ff. Tr. 6927-A, at 1. It should be noted, however, that the submergence and subsequent failure of safety-related electrical equipment did not occur until after completion of its intended safety function. Braulke-1, ff. Tr. 6820, at 4. The Licensing Board made specific findings on the question of TMI-1 equipment qualification for submergence. See I.D., ¶¶ 1169-1174.

Beyond that, the Licensing Board should have been content to rely upon the programs, outside of and incidental to this proceeding, to review the environmental qualification of safety-related electrical equipment pursuant to IE Bulletin 79-01B and the Commission's decision in Petition for Emergency and Remedial Action, CLI-80-21, 11 N.E.C. 707 (1980). These efforts are above and beyond the known environmental qualification lessons learned at TMI-2.

The Licensing Board correctly took notice of this independent activity by the Commission and the Staff which has overtaken the litigation of former UCS Contention 12. See I.D.,

(Continued)

Contention No. 12, UCS Contention No. 14 and UCS Contention No. 3 (Safety Classification) ("Braulke-1").

^{63/} Licensee's Testimony of George R. Braulke in Response to Board Questions on UCS Contention 12 ("Braulke-2").

^{64/} NRC Staff Testimony of Zoltan R. Rosztoczy in Response to Board Questions on UCS Contention 12 ("Rosztoczy-2").

¶¶ 1145-1148, 1158-1161. The Commission already has established the criteria for equipment qualification at TMI-1 (and at other operating reactors) and a deadline by which qualification must be demonstrated.^{65/} An order has already issued imposing these requirements as a condition of the TMI-1 operating license. See I.D., 1145-1148.

In addition, under the provisions of the license Technical Specifications, if a licensee determined during the review that a safety-related piece of equipment cannot perform its intended function during a postulated event or its failure can contribute to more severe consequences, the licensee must file a Licensee Event Report (LER) and initiate appropriate corrective actions. Rosztoczy-1,^{66/} ff. Tr. 6927-A, at 4. Thus, the Commission has also provided for corrective action in the interim where the review pursuant to IE Bulletin 79-01B indicates that such actions is warranted.^{67/}

^{65/} More recently, the Commission has issued for comment a proposed rule on Environmental Qualification of Electric Equipment for Nuclear Power Plants. If adopted, the regulation would, inter alia, extend the June 30, 1982 deadline set by CLI-80-21. See 47 Fed. Reg. 2876 (January 20, 1982).

^{66/} NRC Staff Testimony of Zoltan R. Rosztoczy Relative to Environmental Qualification of Equipment Important to Safety (UCS Contention 12 in part), ("Rosztoczy-1").

^{67/} Licensee has filed Licensee Event Reports pursuant to IE Bulletin 79-01B, begun replacement programs, and relocated equipment. Braulke, ff. Tr. 6802; Tr. 6820-21, 6828-32 (Braulke).

As the Licensing Board stated, ". . . the question posed in this proceeding has been addressed generically by the Commission in CLI-80-21." I.D., ¶ 1157.

It is puzzling to Licensee, then, that the Licensing Board also appears to be dissatisfied with the NRC Staff's testimony which reviews equipment qualification for a design basis small-break LOCA (1% fuel failure). See I.D., ¶¶ 1151-1156. While the Licensing Board may have been concerned about the qualification of TMI-1 equipment for TMI-2-accident radiation levels, the Staff's review under IE Bulletin 79-01B will consider the release from the core of 100% of the noble gases, 50% of the halogens, and 1% of the solids. Braulke-1, ff. Tr. 6820 at 7, 8; Tr. 22,133-38 (Rosztoczy). This will bound the radiation levels inside containment which occurred during the TMI-2 accident. Braulke-1, ff. Tr. 6820, at 7, 8.

The Licensing Board evidently was frustrated that the Staff's 79-01B review was not proceeding on a schedule consistent with this separate proceeding. See I.D., ¶ 1157. The Staff, however, is marching to the schedules set by the Commission and the review simply was not completed, even though the Staff witness appeared as the last item of business in the plant design phase of the hearing. In the end, however, the Licensing Board stated "[w]e see no basis upon which to treat TMI-1 differently than other operating reactors on the issue of radiation

environmental qualification of electrical equipment." I.D.,
¶ 1161.

Returning to the UCS Brief, 70 UCS proposed findings of fact are cited to support the sweeping propositions that TMI-1 safety systems "cannot" be shown to be qualified to GDC-4, that it has not been established that safety equipment can withstand a small-break LOCA, and that new equipment has not been reviewed for qualification. See UCS Brief at 76, 77. To the extent that the Appeal Board chooses to review and consider those proposed findings, Licensee has responded to them in its Reply Findings 286-319, July 27, 1981.

Nowhere does the Licensing Board find the testimony of Licensee witness Braulke to have been conclusory or vague, as UCS complains. See UCS Brief at 77-79. UCS apparently would be satisfied with nothing less than Licensee's entire submittal to the Staff under IE Bulletin 79-01B. Such evidence was neither required nor appropriate for this proceeding.^{68/}

To the extent UCS quarrels with the Licensing Board's certification requirement here (UCS Brief at 79, 84), UCS takes

^{68/} It is not clear that the Licensing Board's "reasonable progress" finding, I.D., ¶ 1161, the subject of UCS argument (UCS Brief at 77-79) if not exception, even is required. This is a long-term action only in the sense that the Commission-established completion date was beyond the projected restart date for TMI-1. It is not, however, a long-term requirement in the context of the Commission's Order and Notice of Hearing.

issue with the process established by the Commission itself in its Order and Notice of Hearing. The Commission provided for Staff certification to it of the NRR Director's findings on the satisfactory completion of actions specified by the Licensing Board. While we believe the requirement is not necessary to a decision to lift the suspension of the TMI-1 license, it is not a "new record" in the sense in which UCS argues. It is, at worst, information on the IE Bulletin 79-01B program which is available for Commission review independent of this proceeding.

UCS argues, almost in passing, that ". . . even a cursory perusal of the Staff's safety evaluation report (UCS Ex. 40) shows many components which lack qualification." See UCS Brief at 80. Not one item is identified. Further, UCS improperly mixes "lack qualification," which may be a documentation deficiency, with the requirement "to modify or replace inadequate equipment promptly." See id. It is UCS, and not the Licensing Board, which has an erroneous interpretation of CLI-80-21. While corrective action is being taken for known deficient equipment, the positive demonstration called for by CLI-80-21 is pursuant to the Commission's schedule.

When UCS implies that compliance to GDC-4 should be assessed with LOCAs beyond the design basis, it incongruously suggests ignoring one Commission regulation in favor of another. See UCS Brief at 81, 82.

The challenge UCS now mounts to the Licensing Board's rulings on high energy and main steam line breaks goes to the seminal ruling on the scope of the entire proceeding. UCS presents no law or evidence to question the correctness of that ruling. See id.

In sum, UC attempted to challenge, before the Licensing Board, actions which the Commission had already taken with respect to qualification criteria, implementation schedules, and continued operation of licensed plants; and to expand the issue to what the Licensing Board said in the beginning it was not -- an entire review of Licensee's compliance with GDC 4.

J. The "Necessity" Standard
(Exception 110)

UCS Exception 110 asserts that the Licensing Board adopted an improper standard for determining, under the terms of the Commission's August 9, 1979 Order, what is necessary to provide reasonable assurance that the facility can be operated without endangering the health and safety of the public. UCS proposes, therefore, that the Appeal Board reject the Licensing Board's standard or reopen the proceeding to allow UCS to address the standard.

In order to construct this argument, UCS has: (1) mischaracterized the standard actually articulated by the Licensing Board; (2) erroneously presumed that the UCS version of

the standard was applied by the Licensing Board and was pivotal in its rejection of the UCS contentions; and (3) misstated the law which governs the NRC's duty to protect the health and safety of the public.

UCS attacks here a Licensing Board discussion, in the midst of its resolution of a dispute between Licensee and the Staff on the Detection of Inadequate Core Cooling, on the standard for determining need or necessity under the Commission's Order and Notice of Hearing in this proceeding. See I.D., ¶¶ 674-689. UCS concludes, from this discussion, that "[r]ather than judging proposed actions strictly on the basis of whether they are essential to assuring the safety of the reactor, the Board has improperly taken into account the technical feasibility of proposed actions in reaching its final judgements." UCS Brief at 49. UCS implies that the Licensing Board concluded "that actions necessary to safety would not be required," and that the Board dispensed "with actions essential to safety simply because they are technically or financially infeasible." See id. at 52-53, 54. This totally misrepresents the Licensing Board's discussion. In no case did that Board find that a proposed action was "essential" or "necessary" to safety, but reject it because of technical or financial infeasibility.

The Licensing Board's discussion on the standard for determining need, in order to be properly understood, must be

placed in the context of the dispute over reactor water level instrumentation which, as the Board stated, brought the standard into sharp focus. See I.D., ¶ 674. The Licensing Board and the participating parties (Licensee, the Staff and the Commonwealth of Pennsylvania) were grappling here with a long-term recommendation in NUREG-0578, by the TMI-2 Lessons Learned Task Force, that "Licensees shall provide a description of any additional instrumentation or controls (primary or backup) proposed for the plant to supplement those devices cited in the previous section [existing instrumentation plus a saturation meter] giving an unambiguous, easy-to-interpret indication of inadequate core cooling." See I.D., ¶ 633. The Task Force neither identified the equipment, or even the concept for the equipment, to be considered, and even left open the possibility, in Licensee's view, that upon further study and investigation it might be concluded that no additional instrumentation is required. In this situation, it was at best difficult to focus upon the "necessity" of instrumentation which, even at the time of hearing, was not very well defined. See I.D., ¶¶ 665 and 672 (Board comments on the state of the art for such instrumentation).

Licensee's reading of the Licensing Board's discussion is that the Board was attempting to expand upon the scope of proposed actions it could require, and not to narrow it as UCS argues. The Board pointed out that

The term "necessary" in normal English would be synonymous with the absolute concept of "indispensable" and essential." I given "necessary" measure under the Commission's order could fairly be regarded as a sine qua non to reasonable assurances of public safety.

I.D., ¶ 675. The Licensing Board did not feel constrained, however, to find first that the plant is unsafe before it could require additional measures to improve safety. See id., ¶ 685. This is where UCS jumps ahead of the Licensing Board and misconstrues its opinion. UCS would have us believe that the Board found TMI-1 to be unsafe (i.e., that there was not reasonable assurance it could be operated without endangering the health and safety of the public), but improperly considered feasibility in establishing the measures needed to correct the situation. This is not what happened at all. Rather, as we have stated, the Licensing Board determined that it could find additional measures to be "necessary" without having first to find that TMI-1 is unsafe to operate. And in deciding what might produce a substantial and additional protection to the public health and safety, the Licensing Board considered feasibility.^{69/} See I.D., ¶ 689.

^{69/} It must be observed that if the Licensing Board's decision on the water level indication issue best illustrates its use of the feasibility consideration, it appears to Licensee that the Board does not easily discard proposals on this basis. There was no record to support the feasibility of water level instrumentation for TMI-1 other than the optimistic opinion of Staff witness Ross that he believes it unlikely that the indicators will prove to be infeasible. See I.D., ¶ 671, n.76.

UCS asserts that "[a]lthough the Board does not specifically discuss feasibility in ruling on the various actions proposed by the parties, one must assume that the Board took feasibility into account in reaching all of its conclusions." UCS Brief at 55. Licensee disagrees that such an assumption is either required or appropriate. While the Licensing Board did state that its discussion on need "exemplifies the consideration given to the 'necessary' standard in other plant modification issues," I.D., ¶ 674, the feasibility consideration cannot be considered to have been pivotal to the Board's decision-making unless, as to some issue, the Board found that there was a serious safety deficiency which warranted correction. Then, if the Board failed to require measures to address the concern, UCS might infer that feasibility played a role.

This clearly did not happen, and no doubt explains why UCS chose to argue this point conceptually, rather than as it applies to the issues decided by the Licensing Board. A quick look at the UCS contentions brought to trial by UCS makes it clear that feasibility did not enter into the Licensing Board's disposition of the issues raised by UCS.

UCS Contentions 1 and 2 challenge the adequacy of natural circulation to remove decay heat at TMI-1 in the event of a small-break LOCA. I.D., ¶ 601. The Board, however, found "that, contrary to UCS Contention 1, the accident at TMI-2 did

not demonstrate that natural circulation is inadequate to remove decay heat." Id., ¶ 611. In answer to UCS Contention 2, the Board found "that operation of the reactor coolant pumps following a small-break LOCA is not required to assure adequate cooling of the core," and that "[i]n the event that natural circulation is interrupted, the decay heat can be dissipated by other means until natural circulation is restored." Id., ¶ 629. The Licensing Board did not reject the UCS contentions here because there was no feasible way to implement them. Rather, the UCS contentions were clearly rejected because they had not identified a safety concern.

UCS Contention 3, which proposed to make the pressurizer heaters safety grade, was rejected because the Board found UCS's arguments regarding safety-grade requirements for pressurizer heaters to be unpersuasive, not because they were infeasible to accomplish. I.D., ¶ 756. Similarly, the Licensing Board did not require a safety-grade PORV (UCS Contention 5) because the Board found that

. . . contrary to UCS' contention, proper operation of the PORV and associated block valve, and the instruments and controls for these valves is not required to mitigate the consequences of design basis LOCAs and, although the failure of the PORV can create or aggravate a LOCA, the consequences of such an accident can be safely mitigated by safety-grade equipment.

Id., ¶ 792. The Board did not have to consider feasibility here, since there was no safety reason found to contemplate the measures suggested by UCS.

The Licensing Board rejected the UCS proposed interlocks on safety systems (UCS Contention 10), not because of technical infeasibility, but because the Board disagreed with UCS and found it desirable and appropriate, under applicable standards and the TMI-2 lessons learned, to retain operator flexibility. I.D., ¶¶ 743, 745; see also I.D., ¶ 770 (on UCS Contention 4) and ¶ 1003 (on UCS Contention 14).

Finally, UCS challenges the law cited by the Licensing Board in association with its discussion of the standard for determining need.^{70/} First, UCS attacks the Board's use of the Commission's backfit regulation, 10 C.F.R. § 50.109(a), which provides that "[t]he Commission may . . . require the backfitting of a facility if it finds that such action will provide substantial, additional protection which is required for the public health and safety or the common defense and security." The Licensing Board observed, and Licensee agrees, that "[i]n practice the Commission requires substantial improvements in the safety of nuclear facilities even where, under preexisting

^{70/} UCS also criticizes the Licensing Board's use of the Commission's revised policy statement on NUREG-0737, which approves a sequence of actions that will result in a gradually increasing improvement to safety. I.D., ¶ 688. UCS states that the Commission there only addressed the scheduling of improvements, and not what is required. UCS Brief at 54. Nevertheless, in adopting an incremental implementation of what is required, and a schedule for doing so, the Commission clearly recognizes feasibility and rejects the UCS "black and white" thesis. See Id.

technology, the facility design had been considered adequate to protect the public health and safety." See I.D., ¶ 685.

UCS argues that there is nothing in the backfit regulation that would permit consideration of feasibility:

If an action would provide substantial additional protection, it would be required regardless of whether it is feasible. If it is not feasible, the plant may not operate.

UCS Brief at 54 (footnote omitted). This is entirely circuitous reasoning. Unless feasibility is considered, there is nothing to provide assurance that some conceptual action would, in fact, provide substantial additional protection.

There are several reasons to conclude that the Commission's backfitting regulation is intended to include such a practical consideration as the feasibility of the proposed retrofit. First of all, the Commission's discussion of the purpose of the regulation at the time of its promulgation in 1970 makes clear that backfitting is desirable to accommodate developments in technology which result in specific improvements which can be made to previously licensed facilities.

The rapid changes in technology in the field of atomic energy result in the continual development of new or improved features designed to improve the safety of production and utilization facilities. Section 50.109 which follows defines the circumstances under which the Commission may require backfitting of facilities -- that is, the addition or modification of structures, systems or components affecting the safety of the facility after the construction permit has been issued.

35 Fed. Reg. 5317 (1970). If an improvement exists only in theory, it cannot be the subject of backfitting. Obviously, then, the backfitting regulation does not come into play unless and until a specific modification is feasible; at that juncture, the issue becomes whether a licensed facility should be required to be backfitted to accommodate the modification.

Further insight into the NRC's implementation of 10 C.F.R. § 50.109 can be gained from a decision denying a rule-making petition requesting seismic reanalysis of all operating power reactors, in which the Director of Nuclear Reactor Regulation discussed, inter alia, the function of the Commission's backfitting regulation. See In the Matter of Petition Requesting Seismic Reanalysis, DD-80-1, 11 N.R.C. 153, 165-66 (1980). This decision was allowed by the Commission to become the final action of the agency.

In evaluating the subject petition, the Director reviewed the Commission's ongoing seismically oriented programs, including the Systematic Evaluation Program ("SEP"), a program which evaluated the seismic design adequacy of eleven older nuclear power plant facilities. Recognizing the evolution in the standards utilized to assess seismic design safety, the NRC nevertheless had to make an assessment of the seismic design safety of the SEP facilities relative to those designed under current standards, criteria, and procedures and to make an

integrated evaluation to verify that these facilities possessed acceptable levels of seismic resistance capability. 11 N.R.C. at 165.

Having recognized and considered in more detail the inherent capabilities of these [older] facilities, a decision will be made regarding the need to retrofit. It must be emphasized that if such an eventual decision is made, it does not necessarily imply that the existing facilities are unsafe but rather that substantial benefit to the public health and safety can be attained through such actions in accordance with 10 CFR 50.109.

Id. at 166. Thus, a requirement to backfit is not concomitant with a recognition that a facility is unsafe without the proposed action.

That judgments, and not absolutes, govern the Commission's licensing decisions is clear from the "reasonable assurance" standard which accompanies "necessary and sufficient" in the August 9, 1979 Order and Notice of Hearing. The following discussion in Nader v. Ray, 363 F. Supp. 946, 954 (D.D.C. 1973), cogently explains the legal basis for this standard:

Under the Atomic Energy Act, the standard applied in issuing facility operating licenses for nuclear power reactors is whether the Commission can find that there will be "adequate protection to the health and safety of the public." 42 U.S.C. § 2232(a). This has been interpreted by the expert agency to mean that it must be able to find "reasonable assurance that the health and safety of the public will not be endangered by operation of the facility. . . ." 10 C.F.R. § 50.35(c); see also id. §§ 50.40(a), 50.57(a)(3). The "reasonable assurance" standard was upheld by the Supreme

Court in the landmark case of *Power Reactor Development Co. v. Int'l Union, Electrical Workers*, 367 U.S. 396, 81 S. Ct. 1529, 6 L. Ed.2d 924 (1961).

Absolute certainty or "complete," "entire," or "perfect" safety is not required by the Atomic Energy Act, nor does nuclear safety technology admit of such a standard. *Power Reactor Development Co. v. Int'l Union, Electrical Workers*, supra, cf. *Crowther v. Seaborg*, 312 F. Supp. 1205, 1234 (D. Colo. 1970). The Supreme Court recognized in the *Power Reactor* case that nuclear technology is subject to change. 367 U.S. at 408, 81 S. Ct. 1529, 6 L. Ed.2d 924. What constitutes "reasonable assurance of adequate protection" is also subject to change, as the state of the nuclear safety art advances. Cf. *Crowther v. Seaborg*, supra. It is for the Commission to weigh the state of that art, the risk of accidents, the record of past performance, the need for further improvement in nuclear safety matters, and other considerations. Balancing these factors calls for the exercise of discretion by the expert agency in a judgmental process that is very different from the kind of "clear, nondiscretionary legal duty" to comply the procedural requirements of the National Environmental Policy Act that the court referred to in *Izaak Walton League of America v. Schlesinger*, 337 F. Supp. 287, 291 (D.D.C. 1971).

See also, Nader v. Nuclear Regulatory Commission, 513 F.2d 1045, 1052 (D.C. Cir. 1975).

In short, UCS totally misreads the Atomic Energy Act, Commission regulations, and the applicable case law^{71/} in its

^{71/} The cases cited by UCS, which construe the Clean Air Act and the Federal Water Pollution Control Act, clearly do not apply to the situation here. See UCS Brief at 55. Those statutes, unlike the Atomic Energy Act, prescribe quantitative pollution standards to be met.

effort to challenge the Licensing Board's consideration of feasibility.

K. Delegations and Conditions
(Exceptions 111-116)

UCS exceptions 111 through 116 charge generally that the Licensing Board, in several instances, improperly delegated to the Staff the responsibility to decide contested issues. UCS Brief at 57-61. UCS simply misperceives the division of responsibility between the Licensing Board and the Staff which was contemplated by the Commission in framing its August 9, 1979 Order in this proceeding. The Commission there stated:

Satisfactory completion of the required actions will be determined by the Director of Nuclear Reactor Regulation. However, prior to issuing its decision the Board shall have authority to require staff to inform it of the detailed steps staff believes necessary to implement actions the Board may require and to approve or disapprove of the adequacy of such measures.

Order and Notice of Hearing, CLI-79-8, 10 N.R.C. 141, 148 (1979). The unmistakable import of this language is that the Licensing Board could, but was not expected routinely to, inquire into the details of the Staff's plans for implementing the Board's decision. Clearly, the Staff alone was given the responsibility for determining that the actions directed by the Licensing Board are satisfactorily completed. Thus, as the Licensing Board observed, it has sole responsibility for making the adjudicative

determinations on contested issues, but the Staff bears the primary responsibility for implementing and enforcing those determinations. I.D., ¶ 1216.

The Licensing Board has already made the adjudicative determinations on all contested plant design issues in this proceeding. The specific items cited by UCS as matters improperly delegated to the Staff simply do not rise to the level of adjudicative determinations, but rather are fairly characterized as implementation and enforcement of the Licensing Board's determinations. One of the items cited by UCS -- the approval of a long-term solution to the steam generator bypass logic problem (Exception 116) -- relates to long-term requirements, and must of necessity involve further Staff action.^{72/} The only cited matter related to short-term items is the Board's resolution of UCS Contention 4 (Exceptions 114, 115), which directs the Staff to verify certain provisions of plant procedures and to monitor and evaluate a particular test specified by the Licensing Board -- clearly tasks of implementation and enforcement. See I.D., ¶¶ 771-773.

UCS also attacks the Licensing Board for "delegating its responsibility as decision-maker to the Staff to establish

^{72/} The Licensing Board provided further direction to the Staff on the implementation and enforcement of this matter in its Memorandum and Order Modifying and Approving NRC Staff's Plan of Implementation (April 5, 1982), slip op. at 3-4.

license conditions" (Exceptions 111-113, particularly Exception 111). To the contrary, the Licensing Board expressly recognized that to leave the entire enforcement responsibility to the Staff would be an excessive delegation of the Board's responsibilities. I.D., ¶ 1216. Accordingly, in its Initial Decision, the Licensing Board deferred issuing its final decision on which of the various Staff requirements, Licensee commitments and Board-imposed conditions should be made license conditions, and the Board directed the Staff to present a plan for the implementation of the Board's decision on plant design and unit separation matters. I.D., ¶ 1217.

The Staff subsequently reported the details of its enforcement plan. Licensee responded, challenging some aspects of the enforcement plan. UCS also replied,^{73/} criticizing the Board's approach to enforcement, and faulting some aspects of the Staff's plan. The Staff later filed a response to Licensee's position. The Licensing Board ruled that the implementation plan proposed by the Staff was generally sufficient, but required some modifications and additions. As modified and amended, the Licensing Board adopted the proposed enforcement plan as its order in this proceeding. Memorandum and Order Modifying and

^{73/} As UCS now concedes, contrary to its assertion in Exception 112, the Licensing Board invited all parties to respond to the Staff's proposed implementation and enforcement plan. I.D., ¶ 1217.

Approving NRC Staff's Plan of Implementation (April 5, 1982), slip op. at 2-3. No exceptions have been taken to that Order.

It is thus simply untrue that the Licensing Board delegated to the Staff the responsibility for establishing license conditions; all parties, (including UCS) were permitted to comment on the Staff's proposed implementation and enforcement plan, which was modified and amended by the Board and -- ultimately -- adopted as its order on the subject. Further, putting aside the merits of UCS's assertion that the Licensing Board authorized restart prior to the establishment of license conditions, the Board has now in fact established those conditions prior to restart. UCS's complaint about the timing of the establishment of license conditions vis-a-vis restart has therefore been rendered academic.

L. Unresolved Generic Safety Issues
(Exception 117)

UCS Exception 117 castigates the Licensing Board for its rejection of proposed UCS Contention 17, which alleged that TMI-1 should not be allowed to operate in the absence of a resolution of all unresolved generic safety issues. UCS asserts that the Licensing Board rejected the proposed contention as lacking in specificity, notwithstanding UCS's identification of two specific examples of generic issues it wished to litigate -- "(1) interaction between safety and non-safety systems (Task

A-17) and (2) environmental qualification of safety-related equipment (Task A-24)." UCS Brief at 61, 62.

However, as the Licensing Board noted in rejecting proposed UCS Contention 17, both the examples cited by UCS were the subjects of other UCS contentions which were accepted by the Licensing Board, and which were in fact litigated. See First Special Prehearing Conference Order, LBP-79-34, 10 N.R.C. 828, 838 (1979); I.D., ¶¶ 971-1004 (Systems Classification and Interaction -- UCS Contention 14); ¶¶ 1139-1181 (Equipment Qualification -- UCS Contention 12). If UCS wished to litigate other generic issues, it was required to "do more than * * * [refer generally to] what amounts to a check list of [such] items." Gulf States Utilities Co. (River Bend Station, Units 1 and 2), ALAB-444, 6 N.R.C. 760, 772 (1977). In any event, UCS should not at this late date be permitted to identify for the Appeal Board and the Commission unresolved safety issues to be litigated for application to TMI-1, when it failed to timely specify those issues for the Licensing Board and the other parties.

M. NEPA and Class 9 Accidents.
(Exception 120 [or 118])

UCS Exception 118 claims that the Licensing Board improperly excluded from consideration UCS's proposed Contention 20, which alleged that an environmental impact statement must be

prepared in connection with the restart proceeding on the issue of the environmental impact of Class 9 accidents. However, UCS's argument in support of its claim ignores the reasons given by the Licensing Board in its Memorandum and Order, dated December 15, 1981, for rejecting UCS's proposed contention and for concluding that Class 9 accidents had been adequately evaluated in the proceeding.

Before discussing the Licensing Board's reasons, it is first necessary to dispose of two misrepresentations made by UCS at the outset of its argument concerning the Board's rulings in its December 15 Memorandum and Order.

First, UCS states that the Licensing Board ruled that "preparation of an environmental impact assessment was not ordered by the Commission and therefore not required." UCS Brief at 62. The Licensing Board made no such ruling. The Board did acknowledge initial doubt as to whether the Commission in its August 9, 1979 Order meant to include the need for an EIA or EIS as part of its mandate and jurisdiction. However, considering the provisions of Part 51 and the fact that no party had urged the Board to dispose of NEPA issues on jurisdictional grounds, the Licensing Board "decided to rule on the NEPA contentions." Memorandum and Order (December 15, 1981), slip op. at 5. The Licensing Board then proceeded to rule on NEPA contentions, including UCS Contention 20, without further question as to its jurisdiction.

Second, UCS represents that the Licensing Board "refused to consider UCS contention 20 regarding the impacts of Class 9 accidents, as the NRC policy statement on that issue did not require such impacts to be considered." UCS Brief at 62. Licensee did indeed urge the Licensing Board to reject requests for an environmental statement on Class 9 accident impacts on the ground that Class 9 accidents had been considered in the initial operating license proceeding for TMI-1 under the guidance then provided by the Commission, and that under present guidance from the Commission no further EIS need be prepared on the subject. This is still Licensee's position.^{74/} The Licensing Board, however, expressly declined to rest its ruling on this ground, stating that "the Board is uncertain as to whether the new risk assessment policy applies or does not apply to the TMI-1 restart." Memorandum and Order, supra, at 12. The Licensing Board held instead, for reasons discussed below, that "if the new policy does not apply, the EIA as supplemented by the hearing record and our Partial Initial Decision, contains an adequate evaluation of Class 9 accidents." Id.

The Licensing Board was explicit about its reasons for rejecting UCS Contention 20:

^{74/} Commission Interim Statement of Policy dated June 13, 1980, 45 Fed. Reg. 40101. See Licensee's Reply to Sholly Motion to Reject the NRC Staff Environmental Impact Appraisal on TMI-1 Restart, April 20, 1981, at 5-7.

In determining the scope of the proceeding our guiding rule has been that we hear and decide only those issues with a reasonable nexus to the TMI-2 accident. The rule is based on the facts that TMI-1 was reviewed and approved at the operating license stage and that, but for the accident, we would not be involved in this particular proceeding. The review at the operating license stage included not only a safety evaluation but also NEPA environmental review culminating in the issuance of an EIS. It is appropriate, therefore, to apply the nexus rule again as we consider NEPA environmental contentions.

We reject several contentions for lack of nexus to the accident. UCS Contention 20, for one, is rejected on this ground to the extent it calls for an analysis of all Class 9 accidents. This is merely an extension of our ruling in the safety area, where we limited the scope of the Class 9 accident inquiry to accidents with a reasonable nexus to the TMI-2 accident.

Id. at 9-10. UCS not only ignores in its comments the basis advanced by the Board for rejecting the proposed UCS contention, but also the role of UCS itself as a proponent of the "guiding rule" that the Board hear and decide only those issues with a reasonable nexus to the TMI-2 accident.^{75/} UCS made no attempt to bring its contention within the ambit of accidents having a nexus to the TMI-2 accident.

The Licensing Board did not end its consideration of the NEPA/Class 9 issue with its rejection of the UCS contention

^{75/} I.D., ¶ 24, LBP-81-32, 14 N.R.C. 381, 394 (1981).

or with the fact that no party presented for litigation any factual basis for assessing the impact of a Class 9 accident having a nexus to the TMI-2 accident. It decided, in the light of its own extensive inquiries into Class 9 accidents as a safety issue, that the Staff had an adequate basis for treating as "incredible" those Class 9 accidents with a nexus to the TMI-2 accident and that the Staff EIA as supplemented by the hearing record and the Board's Partial Initial Decision contains an adequate evaluation of Class 9 accidents. Id. at 11-12. Thus, while UCS is literally correct in stating that the record in this proceeding is devoid of any evidence of the impacts of Class 9 accidents, the record does contain ample evidence on which to conclude that the impacts of Class 9 accidents having a nexus to the TMI-2 accident need not be considered.

III. EXCEPTIONS OF THE COMMONWEALTH OF PENNSYLVANIA

The Commonwealth of Pennsylvania ("Commonwealth"), participating in the TMI-1 restart proceeding as an "interested State" pursuant to 10 C.F.R. § 2.715(c) (see I.D., ¶ 16), filed two exceptions to the Licensing Board's December 14, 1981 Partial Initial Decision on Plant Design and Procedures, Separation, and Emergency Planning Issues. The Commonwealth's exceptions relate solely to the emergency planning issues considered by the Licensing Board, and then only to the narrow question of adequate

dosimetry for offsite emergency workers. The Commonwealth claims that it was legal error for the Licensing Board not to have found that adequate supplies of permanent record dosimetry are required to be predistributed to the affected risk counties prior to restart of TMI-1. Commonwealth Br. at 4.

In order for the Appeal Board to evaluate this claim it is necessary to consider the Commonwealth's planning with respect to radiological exposure control for offsite emergency workers and the supply of dosimetry available for such emergency workers. That review demonstrates that the Commonwealth has developed adequate procedures to control the radiological exposure of offsite emergency workers and that there is adequate dosimetry available to implement the Commonwealth's plan.

This is not to say that the plan could not be improved with the availability of additional permanent record dosimeters. It is, in fact, a truism that all emergency plans, whether they be Licensee's or those of the state and counties, could be improved through the acquisition of additional resources. The issue before this Appeal Board, however, is whether the state of emergency preparedness around TMI-1, considering the present availability of dosimetry, "provide[s] reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. . . ." See 10 C.F.R. § 50.54(s)(2)(ii). Licensee submits that it does, as a review of the record demonstrates.

The Commonwealth's Emergency Plan delegates to the state Bureau of Radiation Protection ("BRP") responsibility for developing guidance to limit the radiological exposure of emergency workers and ensuring that adequate dose records are maintained, collected, analyzed, and acted upon as required. Pa. Ex. 2a, at § VII.A.8.c, p. 15. Pennsylvania's Emergency Management Agency ("PEMA"), in conjunction with BRP, is to develop procedures for the distribution and use of dosimetry resources. Id. at § VII.A.17.r, p. 22.

In its emergency response plan, BRP provides for the radiological exposure control of emergency workers as follows:

Emergency worker dosimetry capability is described in the PEMA Disaster Operations Plan, Annex E, Appendix 16. The Bureau TLD System will be at [Licensee's] EOF [Emergency Operations Facility]. Estimation of exposures accrued before TLDs are distributed is developed retrospectively. Internal exposure is established by in vivo bioassay. [Pa. Ex. 2a, at Appendix 8, § XIII.D.3, p. XIII-2.]

Appendix 16 of the Commonwealth's Emergency Plan, entitled "Radiological Exposure Control", details the concept of operations developed by the state for radiological exposure control of the general population and emergency workers. See Pa. Ex. 2a, at Appendix 16, pp. 16-1 through 16-15. With respect to emergency workers, the state plan specifies that each emergency worker is to be provided two self-reading dosimeters, that each emergency worker is to read the dosimeters at least once each

thirty minutes, and that emergency workers should seek to be replaced or complete their assigned task and report to a mass care center when either self-reading dosimeter indicates a total dose in the 15 to 20 rem range. Id. at Appendix 16, § V.B, pp. 16-6 to 16-7.^{76/} If an emergency worker's self-reading dosimeters indicate a dose of 25 rem or more, the worker is to report to a medical facility capable of decontamination and radiation treatment. Id. The Commonwealth's Emergency Plan also provides:

Further, each emergency worker operating in the plume exposure pathway EPZ will be provided with a TLD (thermoluminescent dosimeter) dosimeter which will allow precise [emphasis in original] measurement of radiation exposure at some time after the exposure has been incurred [emphasis added].
[Id.]

While the Commonwealth initially intended to stockpile the necessary dosimetry at a central location -- and this is the concept described in the Emergency Plan of record (see id., pp. 16-7 to 16-10) -- it now appears that the Commonwealth desires to predistribute the dosimetry to the appropriate state, county and local agencies. See Commonwealth Br., Attachment 1. It is undisputed that, with respect to self-reading dosimeters, there are adequate supplies available for predistribution to state, county and local agencies. See Commonwealth Br. at 5.^{77/}

^{76/} At page 11 of its brief the Commonwealth cites from a later version of Appendix 16, § V.B that is not in evidence in this proceeding.

^{77/} In its proposed findings to the Licensing Board the Commonwealth stated:

(Continued next page)

However, the record also indicates that there are inadequate numbers of TLD's available for predistribution. Commonwealth Br. at 5-6.^{78/} It is this shortfall that underlies the Commonwealth's exceptions.

The issue presented is whether the shortfall in TLD's is such that the state of emergency preparedness around TMI does not provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. The only direct evidence on the adequacy of available

(Continued)

Following the June 2 exercise, it was determined that an adequate supply of self-reading dosimetry (CDV-730's and CDV-742's) is available for predistribution to the counties for emergency workers in the plume exposure pathway EP2 for TMI-1. Staff Ex. 21, at 15, 20; Tr. 22476 (Bath); Staff Ex. 20, at 21; Tr. 22386 (Bath).

* * * * *

[The Commonwealth] has committed to predistribute all necessary self-reading dosimetry (CDV-730's and CDV-742's) to the risk counties prior to restart. [Commonwealth of Pennsylvania's Proposed Findings of Fact and Conclusions of Law on Emergency Planning Issues, filed August 13, 1981, at ¶¶ 74 & 76, pp. 49-51.]

^{78/} The record neither indicates how many TLD's the Commonwealth desires to predistribute nor the number of TLD's presently available for predistribution.

dosimetry is that the Commonwealth's present capabilities, though considered a deficiency, are not so severe as to render offsite emergency preparedness capabilities inadequate. See Staff Ex. 18, at 2.^{79/} John E. Dickey, FEMA's Acting Assistant Associate Director of the Population Protection Office, which includes the Radiological Emergency Preparedness Division, and the most senior FEMA official to testify at the TMI-1 proceeding, when specifically asked about the identified shortfall in dosimetry (TLD's) testified that the deficiency had not precluded FEMA from concluding that the offsite emergency response plans site specific to TMI were adequate and capable of being implemented. Tr. 22687 (Dickey).^{80/} Significantly, no Commonwealth or county witness who testified in the TMI proceeding indicated that the shortfall in TLD's precluded an effective offsite response.

Indeed, the only "evidence" that the Commonwealth identifies as supporting the need for TLD's is the guidance provided in NUREG-0654. The relevant evaluation criterion specifies:

^{79/} FEMA's Interim Findings and Determination states: "In summary, our interim finding is that Pennsylvania State and local government radiological emergency response plans site specific to TMI are adequate."

^{80/} In determining whether state and local emergency plans are adequate and capable of being implemented, the Commission's regulations direct the NRC to "base its finding on a review of the FEMA findings and determinations." 10 C.F.R. § 50.54(s)(3).

Each organization shall make provision for 24-hour-per-day capability to determine the doses received by emergency personnel involved in any nuclear accident, including volunteers. Each organization shall make provisions for distribution of dosimeters, both self-reading and permanent record devices. [Staff Ex. 7, at criterion K.3.a, p. 67.]

This guidance does not suggest the predistribution of any dosimetry (see Tr. 22765 (Adler)), nor by its explicit terms does it even suggest that offsite agencies have TLD's for all emergency workers. Rather, it recommends that each organization have the capability to determine the doses received by emergency personnel. It was the consistent testimony of various FEMA personnel that, although the shortfall of TLD's was a deficiency, it did not necessarily follow that the Commonwealth lacked the ability to determine the doses received by emergency workers.^{81/}

In fact, the Commonwealth's Emergency Plan makes clear that the state does not rely on TLD's as a real-time monitor of the dose received by emergency workers, or to determine when workers should be replaced, or, if necessary, when emergency workers should receive medical assistance. To perform these

^{81/} While the Commonwealth questions the validity and weight to be accorded the FEMA witnesses (see Commonwealth Br. at 12-15), it is significant that this testimony was from the FEMA employees charged with evaluating the Commonwealth's Emergency Plan against the guidance of NUREG-0654. To the extent the Commonwealth relies on NUREG-0654 as support for its position, it is incongruous to dismiss the sworn testimony of the people responsible for interpreting and implementing the guidance document.

operational functions the Commonwealth must necessarily rely on the workers' self-reading dosimeters -- of which there are an adequate number for predistribution. The TLD does provide an historical record of the dose received, but it provides no useful information during the actual response to the emergency.^{82/}

During the TMI-1 proceeding, FEMA witnesses identified three independent factors which influenced their decision that the shortfall in TLD's did not preclude an adequate offsite emergency response.

First, Mr. Bath testified that the Commonwealth's plan could be implemented without a full complement of dosimetry. Tr. 22388-89 (Bath). While this is obviously true, the Commonwealth would have the Appeal Board accord "virtually no value" to the testimony since in the Commonwealth's view the testimony is "entirely speculative" and inconsistent with the regulatory requirements of 10 C.F.R. § 50.47(b)(11). Commonwealth Br. at 13-14. Whatever truth these arguments might have if absolutely no dosimetry were available for offsite emergency workers at TMI, they have little relevance where the facts of record establish that adequate numbers of self-reading dosimetry are available to provide each emergency worker with two independent pieces of monitoring equipment.

^{82/} Indeed, it is not clear to Licensee why with the use of careful recordkeeping the Commonwealth could not use the self-reading dosimeters as a basis for the historical record of the dose received.

Second, both Mr. Adler and Mr. Hardy testified that the available TLD's could be spread further by issuing a TLD to only one member of a group of emergency workers. Tr. 22773 (Adler); 22804 (Hardy). The Commonwealth discounts this "common sense" solution (Tr. 22773), by mischaracterizing it as a suggestion that TLD's be passed around among emergency workers. Commonwealth Br. at 15. This is not what either Mr. Adler or Mr. Hardy recommended. Rather, they indicated that a single person in a group of emergency workers could act as the historical monitor for the entire group. The Commonwealth offers no reason why this is not an appropriate response to the dosimetry shortfall.

Third, Mr. Adler suggested rotating emergency personnel on a frequent basis to guard against possible overexposure. Tr. 22773 (Adler). The Commonwealth responds to this suggestion by claiming that such a procedure, "if possible, would require extensive changes in emergency plans at the state, county and local levels" and "depends on such variable factors as exposure rate, wind speed and wind direction." Commonwealth Br. at 15. Despite baldly asserting that extensive plan changes might be required, the Commonwealth does not particularize the potential changes it foresees. In fact, it is clear that the Commonwealth's Emergency Plan, as originally developed, contemplated that the initial emergency response would take place without the availability of TLD's.^{83/} Whatever flexibility in personnel and

^{83/} In such cases, BRP anticipated making retrospective estimates of emergency worker exposure. Pa. Ex. 2a, at Appendix 8, § XIII.D.3, p. XIII-2.

staffing the Commonwealth felt necessary to accommodate the absence of TLD's presumably already is reflected in the plan. Moreover, since both Licensee and state field monitoring teams will be out monitoring the plume, the results of such monitoring efforts will provide information on exposure rate, wind speed and wind direction necessary to ensure that emergency workers do not exceed the 25 rem limit. Tr. 22804 (Adler).^{84/}

Given the dosimetry already available to offsite emergency workers, the shortfall in TLD's identified by the Commonwealth does not preclude the Commonwealth from determining the dose received by emergency workers and does not preclude a finding of reasonable assurance that adequate protective measures can and will be taken in the event of an emergency at TMI. Accordingly, there is no need for this Appeal Board to adopt the license condition suggested by the Commonwealth.

IV. EXCEPTIONS OF THE AAMODTS

The Aamodts initial listing of 33 exceptions on emergency planning issues (dated January 26, 1982) was subsequently supplemented with an additional 23 exceptions (dated February 5, 1982). Although the Aamodts have treated their

^{84/} Apparently it was precisely this information which BRP intended to use to retrospectively estimate doses prior to the time TLD's were distributed. See n.83, supra.

exceptions as raising two issues relating generally to information transmittal and emergency plans for farmers, the exceptions raise a distinct third issue relating to the ingestion exposure pathway. Licensee addresses each of the three issues seriatim.

A. Information Transmittal and Public Education

Aamodt exceptions 1 through 14 challenge the Licensing Board's findings on the adequacy of emergency plans for information transmittal and public education. The arguments put forth by the Aamodts are based on a misunderstanding of the methods to be used for information transmittal and public education and on a misstatement of the evidentiary record. Accordingly, the Appeal Board should affirm the Licensing Board's resolution of these issues.

As the Aamodts recognize, the primary mode of communication between TMI and Dauphin County is the telephone. However, contrary to the position urged upon the Appeal Board by the Aamodts, the record does not indicate that this telephone circuit can be expected to be "busy." The testimony cited by the Aamodts in fact supports an opposite conclusion. See Tr. 14123-24 (Giangi).^{85/} Backup communications include a radio system that

^{85/} The telephone notifications referred to by the Aamodts take place at the very outset of the emergency. Even if there were evidence that the telephone system might become overloaded at some point into the emergency -- and there is no such testimony -- there is absolutely no reason to believe the telephone system would become overloaded at such an early stage of the accident.

is tested weekly. Rogan, et al., ff. Tr. 13756, at 62, 86.

There is no evidence of record which indicates that this radio link between TMI and Dauphin County might be overloaded. If for some reason TMI could not contact Dauphin County directly, then a communication link would be established through PEMA. This could be effected by telephone or use of the National Warning System ("NAWAS") 11 -- a dedicated radio-telephone line between TMI and PEMA that is tested daily. Id.

The Aamodts also assert that TMI might not be able to contact the other four risk counties in a timely fashion. Pursuant to a concept of operations carefully coordinated between Licensee and the Commonwealth, PEMA has been delegated responsibility for contacting the other four risk counties, except in the event of a General Emergency. Rogan, et al., ff. Tr. 13756, at 88-89; Chesnut, ff. Tr. 15007, at 32. The Licensing Board reviewed this approach and found it acceptable. I.D., ¶ 1518. While the Aamodts do not challenge this concept of operations, it appears that they believe Licensee will be unable to contact the other four counties during a General Emergency due to "busy" telephone circuits. This claim rests on the same mischaracterization of the record previously identified. It also ignores PEMA's commitment to conduct a "parallel" notification of all risk counties immediately following declaration of a General Emergency (Tr. 14266 (Giangi); 15283 (Chesnut)), and Dauphin

County's commitment to notify the other risk counties if necessary (Chesnut, ff. Tr. 15007, at 38).

In addition to these communication capabilities, there are other numerous communication links between TMI and offsite agencies that could be used if other means of communication failed. These include two separate dedicated telephone lines with the NRC (Rogan, et al., ff. Tr. 13756, at 63-64), a dedicated telephone line between TMI and BRP (id. at 19, 60; Tr. 13777 (Giangi)), and three dedicated lines between TMI and Licensee's various offsite emergency response facilities (Rogan, et al., ff. Tr. 13756, at 60-61; Tr. 13778 (Giangi)). TMI's communication capabilities thus go well beyond that required by the Commission's regulations or that recommended in NUREG-0654. See generally Rogan, et al., ff. Tr. 13756, at 59-66. There simply is no reason to believe that TMI will be unable to communicate necessary information to agencies located offsite.

With respect to the Aamodt claims dealing with public education, no one doubts the need to adequately educate the public so that, in the event of an emergency, protective action instructions provided by the communities' elected officials will be meaningfully understood. To achieve this end, Commission regulations and guidance direct that information be made available to the public on a periodic basis instructing the public as to how they will be notified and what their initial actions

should be in an emergency. See I.D., ¶ 1527. The Licensing Board reviewed these standards, and found the coordinated public education programs of the Commonwealth (I.D., ¶¶ 1529-31, 1534-36) and Licensee (I.D., ¶¶ 1532-33) to be adequate. See I.D., ¶ 1537. The Aamodts advance three reasons for overturning this finding.

First, the Aamodts claim that there are no criteria available for judging the adequacy of the public education programs. The sole support for this claim is testimony that the NRC provides minimum guidelines for assessing public education programs, but Licensee's witness was unaware of any set of criteria for judging excellence in a public education program. Tr. 14134-35 (Rogan). Certainly, such testimony does not establish that no criteria are available and is not inconsistent with the Licensing Board's finding that there are appropriate criteria for evaluating public education programs. See I.D., ¶¶ 1527-28.

Second, the Aamodts claim that the existing education programs are themselves inadequate. This claim arises from a dissatisfaction with a portion of the PEMA pamphlet that analogizes ionizing radiation to sunlight, from the unsupported assertion that members of the population more susceptible to radiation are not considered, and from the view that it is somehow inappropriate to jointly share responsibility for public education among Licensee, the Commonwealth, and the five risk

counties. The Licensing Board addressed each of these concerns and found them to be without merit.

Looking specifically at the analogy to sunlight in the PEMA pamphlet, the Licensing Board found it not perfect, but not of such moment as to require a change. See I.D., ¶ 1534, n.182. In reaching this conclusion, the Licensing Board relied on the testimony of FEMA witnesses who reviewed the educational material. Id. Other than their personal view that the analogy is inappropriate, the Aamodts point to no evidence that would cast doubt either on the Licensing Board's conclusion or the testimony of the FEMA witnesses.

Similarly, the Aamodt's claim that members of the population potentially more susceptible to radiation were not considered in the public education material is squarely contrary to the testimony of the cited witness, who testified that the public information that had been distributed included information on the greater sensitivity to radiation of some members of the population. See Tr. 14137 (Rogan); Commonwealth Ex. 3.^{86/}

Nor is there any record support for the Aamodts' assertion that it is inappropriate for Licensee, the Commonwealth and the five risk counties to share responsibility for the public

^{86/} PEMA's Emergency Information Brochure states: "Unborn and very young children are more sensitive to radiation than are older children and adults."

education program. Indeed, the NRC staff witness explained that it was both NRC's and FEMA's intent that utilities and offsite agencies would share responsibility for developing and implementing the public education program. Chesnut, ff. Tr. 15007, at 61. The concern for accountability identified by the Aamodts has been assured since the NRC and FEMA have jointly reviewed the entire coordinated program and found it acceptable. See Chesnut and Bath, ff. Tr. 19626, at 7-10.

Third, the Aamodts allege that it was error for the Licensing Board to deny the Commonwealth's request that distribution of the public education brochures be withheld until all revisions desired by the Commonwealth had been made. In fact, the Licensing Board directed that the pamphlets must contain up-to-date information on evacuation routes and similar information, and that the NRC Staff should review any changes made in the pamphlets and advise the Commission prior to restart on the impact, if any, of the revisions. See I.D., ¶¶ 1536, 2010(b). Significantly, the Commonwealth apparently found these conditions adequate for its purposes and has not excepted to this portion of the Licensing Board's decision.^{87/} Thus, there is no basis for finding that the material to be distributed inadequately reflects the desires of the offsite emergency response agencies.

^{87/} Given the extended period of time that has been available since the Licensing Board's decision, Licensee and Commonwealth representatives have had an opportunity to include all of the Commonwealth's desired changes in the educational material.

B. Emergency Plans for Farmers

Aamodt exceptions 15 through 51 challenge the findings and conclusions of the Licensing Board on the plans for the care of livestock and the impact of those plans on farmers. The Aamodts' exceptions raise essentially two interrelated issues: whether the Commonwealth has developed an adequate plan for the care of livestock, and whether farmers will refuse to evacuate because of their concerns for their livestock.

A recurring theme of the Aamodts' exceptions is that, in rejecting the Aamodts' contention, the Licensing Board erroneously relied upon the testimony of "bureaucrats" while improperly ignoring the testimony of farmers, veterinarians and county agricultural agents. See, e.g., ¶¶ 4, 8, 9, 10, 13. Such a claim is patently untrue. First, the document challenged by the Aamodts -- the plan for the care of livestock -- was developed by the Pennsylvania Department of Agriculture, an agency charged with protecting the interests of farmers and the agricultural community in general. Second, the Commonwealth presented as witnesses Drs. Van Buskirk and Cable, both veterinarians (one of whom has an M.S. in Radiation Biology), who testified that the Department of Agriculture plans provide adequate protection for livestock and farmers. See Van Buskirk and Cable, ff. Tr. 18296. Moreover, the Licensing Board did in fact rely at points upon the testimony of the farmer,

veterinarian and county agriculture witnesses of the Aamodts. See, e.g., I.D., ¶¶ 1926, n.215; 1927; 1928, n.217. However, in according weight to that testimony, the Board was entitled to consider that the prefiled, written testimony of the county agents was actually prepared by Mrs. Aamodt, and that when they appeared to testify, the agents controverted major parts of the written testimony. See Tr. 20246-48. Further, in evaluating the testimony of the farmers chosen by the Aamodts as their witnesses, contrary to the implication of the Aamodts' exceptions, the Board was not required to assume that those three farmers represent the views of the agricultural community around TMI while the Pennsylvania Department of Agriculture does not represent those views.

The Aamodts' exceptions to the Licensing Board's decision spring from a fundamental and pervasive misconception about the nature of the plans for the protection of livestock in an emergency. The Department of Agriculture Plan allows farmers to remain on their farms to care for their livestock during a general evacuation, to evacuate themselves and their families (leaving their livestock behind and notifying the county agriculture agent of the situation), or to evacuate livestock if the livestock is not diseased.^{88/} I.D., ¶ 1925. However, the

^{88/} The Aamodts imply that farmers are not generally free to arrange for the evacuation of their livestock absent legal authorization. Aamodt Br. at ¶ 26. This is expressly contradicted by

(Continued next page)

Commonwealth opposes the general evacuation of all livestock in a radiological emergency as a practical matter:

Evacuation as an option to reduce livestock exposure to radioactivity after an accident is impractical as an across the board action throughout the potentially hazardous area. The priority for road use and transportation is of necessity directed toward protecting the people in any case of immediate evacuation and any attempted movement of livestock would be disruptive. As an additional factor, subjecting the stock to the stresses and disease exposure of an evacuation is likely to present a greater risk to the animal than that caused by radiation.

Pa. Ex. 2a, at Appendix 7, p. 17. No witness was willing to state that the large-scale emergency evacuation of livestock was feasible. Even the veterinarians presented by the Aamodts did not think such an evacuation was feasible. Tr. 18805-06 (Samples).

Nevertheless, the record is replete with evidence that resources are available to support a limited evacuation of livestock, even on short notice. See I.D., ¶ 1928, n.217. Many farmers have their own livestock trucks that can be used to relocate a limited number of livestock, probably beginning with

(Continued)

the record, which establishes that farmers may evacuate their herds without prior authorization from the Commonwealth provided that the herd has not been quarantined. See I.D., ¶ 1928, n.217.

their top dairy cows. See Tr. 20234 (Stewart); 20240 (Smith); 18805-06 (Samples). The farmers can be expected to assist one another with such transportation; during the TMI-2 accident, some even volunteered the use of their trucks to the county agricultural agents. Tr. 20240 (Smith). In addition to the farmers' own trucks, there are a number of commercial livestock haulers in the TMI area. See I.D., ¶ 1928, n.217; Tr. 20240 (Smith). The various government agricultural agencies could assist the farmers in making arrangements with these haulers in an emergency. Tr. 18848 (Furrer). The feasibility of limited evacuation of livestock using these resources was demonstrated in the TMI-2 accident, when livestock trucks were available (Tr. 18727, 18736 (Lytle); Lytle, ff. Tr. 18749), and many people did relocate animals. Tr. 18805 (Samples); 18824 (Weber).

The Aamodts also argue that the livestock plan is inadequate because the provisions for sheltering animals are inadequate. In support of this claim, they cite testimony that not every farmer will be able to fully shelter his entire herd or provide a continuous supply of uncontaminated water. See e.g., Aamodt Br. at ¶¶ 12, 13, 15. Such arguments misconstrue the nature of the plan. No party has taken the position that all livestock will be able to be protected under all conditions, or that all farmers are equipped to provide the maximum degree of protection for their livestock. However, the Department of

Agriculture Plan does include information on various options to permit farmers to use resources on hand to protect a significant portion of their livestock in a radiological emergency. The Department of Agriculture has undertaken to provide information to the agricultural community on the need to take protective actions for livestock by distributing to farmers within the EPZ the "fact sheets" included in the livestock plan, which were developed from the "Disaster Handbook for Extension Agents."^{89/} Pa. Ex. 2a, at Appendix 7, p. 8 and Annex B; Tr. at 20421-22, 18882 (Furrer).

Those "fact sheets" include advice on sheltering animals in various types of buildings, ranging from open sheds to more substantial, closed buildings.^{90/} See Pa. Ex. 2a, at

^{89/} The Aamodts generally attack the reliance placed by the livestock plan on the extension handbook on the ground that the handbook was written "about 20 years ago" (Aamodt Br. at ¶ 14), apparently assuming that it is somehow self-evident that the age of the handbook renders it defective in some (unspecified) way. The Aamodts ignore the evidence, elicited in part from their own witnesses, that the handbook has been revised since it was originally issued, and is currently being revised. See Tr. 18336 (Cable); 18839 (Furrer); 20255 (Stewart). Moreover, contrary to the Aamodts' assertion that the provisions of the livestock plan are untried, Dr. Cable testified that the guidance provided in the plan is used in non-nuclear emergencies. See Tr. 18325 (Cable).

^{90/} Contrary to the implications of the Aamodts' exceptions, significant shelter can be afforded for many animals in the EPZ. See, e.g., Tr. 18328-29, 18330 (Van Buskirk); 18713, 18716 (J. Fisher). The "fact sheets" explain the attenuation factors associated with various types of shelter. See Pa. Ex. 2a, at Appendix 7, Annex B, pp. 5, 11, 21. To the extent that animals can be sheltered in any fashion from the open air, some measure of protection is afforded. Tr. 18876 (Furrer).

Appendix 7, Annex B, p. 5. Similarly broad advice is given with respect to ventilation (id. at 6-7) and feed and water (id. at 7-9).^{91/} More detailed advice is given for the various types of livestock. Id. at 10-22. Recognizing the purpose of the livestock plan, see, e.g., I.D. ¶¶ 1927, 1931, the Licensing Board properly rejected the summary conclusions of the Aamodts' witnesses that the plan is inadequate.

The Aamodts further assert that the Licensing Board failed to appreciate the potential exposure to the farmer in implementing the Commonwealth's livestock plan. Aamodt Br. at ¶¶ 16, 17, 29. To the contrary, the Licensing Board recognized the importance of providing information to farmers about self-protection. I.D. ¶ 1932. In reviewing this issue, the Licensing Board did not simply assume, as alleged by the Aamodts, that the pamphlets being distributed to the general public contained

^{91/} The Aamodts' broad condemnations of the livestock plan, based on the advice provided in the plan with respect to provisions for food and water, are unwarranted. The use of drums of water is suggested only as an option for farmers who have no alternative means to provide water for sheltered livestock. Tr. 18869 (Furrer). Most barns have water piped into them and would therefore have a protected water source, so long as electrical power is available. Tr. 18809 (Samples); Tr. 18327-28 (Van Buskirk). In any event, the witnesses (including the farmers presented by the Aamodts) variously stated that cattle would survive from a minimum of three days up to two weeks with no water whatsoever. See, e.g., Tr. 18719 (Lytle); 18720 (V. Fisher); 18720, 18721 (J. Fisher); 18307 (Cable). Similarly, the Aamodts' own witnesses, the farmers, testified that cattle would survive for at least two weeks without food. Tr. 18720 (J. Fisher).

adequate information to enable farmers to protect themselves and their families in an emergency. See Aamodt Br. at ¶ 29. These documents themselves were in evidence, as were the "fact sheets" (which also provide information on self protection).^{92/} See Pa. Ex. 3, 4, 5, 7 and Pa. Ex. 2a, at Appendix 7, Annex B. Thus, the Licensing Board itself was able to review these documents. The Licensing Board also acknowledged that plans have been made for the distribution of dosimetry and potassium iodide (KI) to farmers with livestock in an emergency. I.D., ¶ 1925, n.214. In fact, the overall thrust of the Commonwealth's livestock plan is to minimize the farmer's exposure by emphasizing storage of feed and water and other advance preparations, which will enable the farmer to evacuate or -- if the farmer elects not to evacuate -- will limit the time the farmer spends unsheltered.^{93/}

^{92/} The Aamodts criticize the public information pamphlets because they would not "compel" the farmers to take protective action, and because they do not include the telephone number of the county agricultural agents. Aamodt Br. at ¶¶ 30, 31. However, the Commonwealth's planning provides for the delivery of information which will emphasize to farmers in particular the need for appropriate protective actions. Tr. 18090 (Corney). Further, there was evidence of the close working relationship between farmers and the county agricultural agents on a day-to-day basis. See, e.g., Tr. 20270-71 (Smith). Given this relationship, it is likely that many of the farmers will already know the county agricultural agent's phone number. In addition, the Aamodts point to no evidence of a need to have that information more quickly than it could be obtained from the telephone directory.

^{93/} The Aamodts express particular concern about the exposure of milking farmers, and imply that four persons would be completely exposed for eight hours per day in milking at a typical farm in

(Continued next page)

The Aamodts also challenge the Licensing Board's finding that farmers have the option of evacuating with their families, leaving their livestock behind, and notifying their county agricultural agents of their status.^{94/} Aamodt Br. at ¶¶ 18, 19, 20. Though the Aamodts characterize the record in support of that finding as "flimsy," the uncontradicted evidence establishes that personnel and other resources will be available to assist in caring for livestock remaining within the EPZ in an emergency.^{95/} See, e.g., Tr. 18850-53, 18883-84 (Furrer).

(Continued)

the TMI area. Aamodt Br. at ¶ 17. However, all the evidence of record suggests that the milking is done in shelter. See generally, e.g., Tr. 18713 (J. Fisher); 18328-29 (Van Buskirk).

^{94/} The Aamodts grossly mischaracterize the role of the county agricultural agent in an emergency. See Aamodt Br. at ¶¶ 32, 33. They ignore the agents' own testimony of their roles in response to the TMI-2 accident. See Tr. 20238-39 (Smith); 20261-62, 20273 (Stewart). The Aamodts further assert that the agents had not received any training in radiation detection or protective actions for approximately 20 years. Aamodt Br. at ¶ 33. To the contrary, one of the agents, Mr. Stewart, clearly explained that he had recently received additional information on radiation and agriculture. Tr. 20235 (Stewart). Further, the Commonwealth's planning provides for additional training for the agents on such subjects. Tr. 18893-94 (Furrer). Finally, the Aamodts assert that the willingness of the agents to remain as emergency workers was not proved. Aamodt Br. at ¶ 33. However, both agents testified that they understood their responsibilities in an emergency. Tr. 20239 (Smith); 20236 (Stewart). And Mr. Smith did expressly testify that, in an emergency, he would stay as long as there were emergency workers in the area. Tr. 20252 (Smith).

^{95/} The Aamodt's attempt to make much of the fact that Mr. Furrer did not know how many farms are located in the plume exposure pathway EPZ. Aamodt Br. at ¶ 20. However, the Aamodts

(Continued next page)

Finally, the Aamodts criticize the plan for the care of the livestock of evacuated farmers, asserting that farmers would not entrust the care of their animals to others. Aamodt Br. at ¶¶ 18, 19. The Aamodts baldly assert that the Board assumed that such an arrangement would be acceptable to the farmers, and claim that no farmer, veterinarian, or county agent was asked whether such an arrangement would be satisfactory. To the contrary, the Aamodts' own witnesses -- farmers from the TMI area -- testified that, if a general evacuation were ordered, the State Department of Agriculture's plan to arrange for the care of livestock would be a consideration in the farmer's decision as to whether they themselves would evacuate. I.D., ¶ 1926, n.215. The Aamodts further complain that the re-entry of farmers into the EPZ to care for livestock during a general evacuation should not be relied upon in the absence of measures for the protection of farmers. Aamodt Br. at ¶ 21. Such measures are planned for farmers in the EPZ, and were described in detail by the Licensing Board.^{96/} I.D.; ¶¶ 1925, n.214; 1933; 1935; 1936; 1937.

(Continued)

fail to note that Mr. Furrer does have information which is much more relevant to planning, such as records of the number of head of cattle located in the EPZ.

^{96/} Aamodt exception number 44, which the Aamodts failed to brief, asserts that the Board did not explain, with reference to paragraph 1937 of its decision, why providing equipment for York County agricultural emergency workers was sufficient. Read in the context of the entire portion of the decision on farmers and

(Continued next page)

The underlying premise of the Aamodts' exceptions is that, despite the Commonwealth's plan for the protection of livestock in an emergency, farmers will not evacuate if they must leave their livestock behind. See generally, Aamodt Br. at ¶¶ 2, 3, 4, 5, 7, 8. However, none of the three farmers who testified at the hearing (all of whom were witnesses on behalf of the Aamodts) indicated that he would not evacuate himself and his family in the event a general evacuation were ordered. Rather two of the farmers stated that they would at the time of the emergency determine whether to leave their livestock and evacuate themselves and their families, based on the precise situation and the availability of means for the care of their livestock in their absence. I.D., ¶ 1926, n.215. The third farmer testified unequivocally that he would in fact evacuate and "abandon" his cows in an emergency. See J. Fisher, ff. Tr. 18749; Tr. 18702-06 (J. Fisher).

In the final analysis, the Commission has determined that "public health and safety should take clear precedence over actions to protect property. Measures to protect property can be taken on an ad hoc basis as resources become available after an

(Continued)

livestock, it is plain that the statement is so limited because it summarizes the resolution of Newberry Contention EP-14(BB), which is exclusively addressed to York County. See I.D., ¶ 1919.

accident." 45 Fed. Reg. 55402, 55407. The Pennsylvania Department of Agriculture plan for the protection of livestock goes far beyond ad hoc measures to be used as resources become available. Rather, it represents a careful analysis of the situation likely to be facing farmers in an emergency and the options available to deal with that situation. As the Licensing Board noted, the Commonwealth's plan effects a proper balance between protecting property and public health and safety.^{97/} I.D., ¶ 1927. Accordingly, Aamodt Exceptions 15 through 51 should be rejected.

C. Ingestion Exposure Pathway

Although the Aamodts have chosen to brief exceptions 52 through 56 as part of their exceptions relating to farmers, the issues raised therein are more appropriately treated separately. These exceptions deal generally with the ingestion exposure pathway and related matters. They are based on the testimony of a single witness, Dr. Bruce Molholt, ff. Tr. 19690, whose testimony was submitted in support of ECNP Contention EP-11. That contention alleged that the Protective Action Guide ("PAG")

^{97/} Contrary to the Aamodts' claim that the Licensing Board failed to appreciate that the focus of concern was the health and safety of the farmers and not the protection of property, Aamodt Br. at ¶ 2, the Licensing Board itself emphasized the distinction. See I.D., ¶ 1926, n.215.

of 1.5 rem to the infant thyroid as the dose to be avoided from milk ingestion fails to account for the fetus, whose sensitivity is asserted to be greater than the infant, and also fails to take into account exposure from the inhalation pathway. Although the Aamodts do not address this contention, and do not challenge the Licensing Board's finding that ECNP Contention EP-11 is without merit (see I.D., ¶ 1723), they do question some of the License Board's subsidiary findings on the tangential issues raised by Dr. Molholt's testimony.

As the Licensing Board observed, Dr. Molholt addressed many areas during his two days of testimony. I.D., ¶ 1713. While the Licensing Board found his arguments "lucid and well presented," the Licensing Board also concluded that Dr. Molholt's "presentation was flawed technically." Id. Quite frankly, Licensee believes that to be a very charitable characterization of Dr. Molholt's testimony. The record evidence indicates that Dr. Molholt lacks background knowledge in the areas about which he testified,^{98/} was factually inaccurate in many cases,^{99/} and offered testimony that he was totally unable to support.^{100/} In

^{98/} See Tr. 19691-92, 19696-98, 19705, 19720-21, 19743 (Molholt).

^{99/} Compare Tr. 19701, 19727-28 with Tr. 19792-93; compare Tr. 19986 with Tr. 20056; compare Tr. 19873-75, 19927-28 with Tr. 19929-33; compare Tr. 19817-20 with Tr. 19835 (Molholt).

^{100/} Compare Molholt, ff. Tr. 19690, at 2 with Tr. 19865-66; compare Molholt, ff. Tr. 19690, at 12 with Tr. 19866; compare Tr. 19936 with Tr. 19936-37 and Dose Calculation, ff. Tr. 21304.

such circumstances, the Licensing Board would have been totally correct in rejecting the whole of Dr. Molholt's testimony. The Licensing Board, however, did not do this, but instead carefully reviewed Dr. Molholt's testimony and determined that his conclusions were not valid. See I.D., ¶¶ 1714-23. The Aamodts identify two of Dr. Molholt's assertions which they claim the Licensing Board incorrectly rejected.

First, the Aamodts argue it was error to reject Dr. Molholt's claim that small rodent (vole) thyroids are a more sensitive and reliable monitor of radioactive iodine in the environment than is milk. The basis for Dr. Molholt's conclusion is a paper written by students at Millersville State College. Molholt, ff. Tr. 19690, at 15. The Millersville conclusion, as reported by Dr. Molholt, is that on a per-weight basis vole thyroids are more sensitive to radioactive iodine than is milk. The error in this analysis is measuring sensitivity on a per-weight basis rather than on a per-sample basis. Because of the extremely small weight of the vole thyroid (about 3 milligrams), measuring sensitivity on a per-weight basis gives a false appearance of increased sensitivity. By comparison, if one assesses sensitivity on a per-sample basis, milk is the more sensitive indicator. Typical sensitivity for gamma spectroscopy of milk allows one to measure down to about 10 picocuries per liter. If one attempted to measure down to the 10 picocurie

level for total activity in a single vole thyroid, the corresponding concentration of radioactivity in the vole thyroid would have to be about 3300 picocuries per gram of vole thyroid. On this basis, it is apparent that the vole thyroid requires a substantially higher concentration of activity than does milk to register an equivalent activity level. Tr. 20501-02 (Peterson).

Moreover, there are substantial practical problems in using vole thyroids as a measure of dose to the human population. The transfer factor from air to the vole thyroid is unknown, Tr. 19841 (Molholt), as are the transfer factors between the forage food of the vole and the vole thyroid. Tr. 19847 (Molholt); see also Tr. 18241-42 (Reilly). Nor is the vole part of the pathway to man, Tr. 19946 (Molholt), as is milk. This means that at the present time, given the lack of inhalation and ingestion transfer factors, there is no way to convert between a measured dose to the vole thyroid and an estimated dose to man. Tr. 19947-48 (Molholt). Thus, the Licensing Board was correct in rejecting Dr. Molholt's suggestion of using vole thyroids as an environmental monitor of radioiodine. See I.D., ¶¶ 1716-17.

Second, the Aamodts argue that it was error to reject the clustering of alleged neonatal hypothyroid cases as evidence of inadequate radioiodine monitoring following the TMI-2 accident. The Licensing Board rejected this argument for three reasons: (i) because the increased rates of neonatal

hypothyroidism were not spatially distributed in the manner which would be expected (I.D., ¶ 1719),^{101/} (ii) because an increase in neonatal hypothyroidism was inconsistent with the large amount of field data collected during the TMI-2 accident (I.D., ¶ 1720),^{102/} and (iii) because the Commonwealth presented convincing direct evidence that the increased incidents of neonatal hypothyroidism cannot be linked to the TMI-2 accident (I.D., ¶¶ 1721-22).^{103/} While the Aamodts attempt to rebut this

^{101/} In addition to the evidence cited by the Licensing Board, there are additional problems in Dr. Molholt's simple numerical comparisons. Six of the neonatal hypothyroid cases identified by Dr. Molholt were in Lancaster County, which he characterizes as downstream but upwind from TMI. Molholt, ff. Tr. 19690, at 13. However, Dr. Molholt provided no mechanism for explaining how the source of drinking water for Lancaster County -- the Susquehanna River -- might have become contaminated. He admits that atmospheric deposition into the river is an unlikely mechanism. Tr. 19880 (Molholt). And while he was willing to guess that radioactive iodine was released directly into the Susquehanna, id., he knew of no evidence that supports such a hypothesis. Id. at 19880, 19883. Nor did Dr. Molholt know whether the mothers of the children with hypothyroidism were actually from the Lancaster area (or merely gave birth in Lancaster County hospitals), Tr. 19992 (Molholt), or whether those mothers drank water from the Susquehanna River, id., or whether those mothers evacuated during the accident, id., 19992-93.

^{102/} The Aamodts apparently do not contest this part of the Licensing Board's reasoning.

^{103/} The Aamodts discount the Commonwealth's testimony by mischaracterizing the Licensing Board's evaluation of the state's witness, Dr. Tokuhata. While questioning his radiobiological expertise, the Licensing Board's conclusion was that it was "more secure in the validity of Dr. Tokuhata's epidemiology expertise and his role as a member of the previously mentioned eleven member Hypothyroidism Epidemiological Investigation Committee, formed by the Pennsylvania Health Department. . . ." I.D., ¶ 1722.

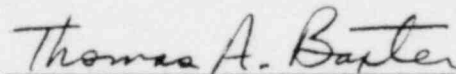
evidence, their brief contains little more than unsupported hypotheses that fail to explain away the evidence of record. In short, the Licensing Board had an adequate basis for rejecting the neonatal hypothyroid claims urged by Dr. Molholt.

V. CONCLUSION

For the foregoing reasons, Licensee respectfully requests the Appeal Board to dismiss with prejudice the exceptions filed by UCS, the Commonwealth, and the Aamodts, and to affirm those portions of the Licensing Board's Partial Initial Decision on Plant Design and Procedures, Separation, and Emergency Planning Issues challenged by these parties.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE



George F. Trowbridge, P.C.

Thomas A. Baxter, P.C.

Robert E. Zahler

Delissa A. Ridgway

1800 M Street, N.W.
Washington, D.C. 20036
(202) 822-1000

Counsel for Licensee

Dated: May 10, 1982

LIC 5/10/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'82 MAY 12 AID:51

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Before the Atomic Safety and Licensing Board

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

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing "Licensee's Brief in Opposition to the Exceptions of Other Parties to the Atomic Safety and Licensing Board's Partial Initial Decision on Plant Design and Procedures, Separation, and Emergency Planning Issues," was served by deposit in the United States mail, postage prepaid, this 10th day of May, 1982, addressed to those persons on the attached Service List.

Thomas A. Baxter
Thomas A. Baxter

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

SERVICE LIST

Gary J. Edles, Esquire (2)
Chairman
Atomic Safety and Licensing Appeal
Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. John H. Buck
Atomic Safety and Licensing Appeal
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Reginald L. Gotchy
Atomic Safety and Licensing Appeal
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Ivan W. Smith, Esquire
Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Walter H. Jordan
Atomic Safety and Licensing Board
Panel
881 West Outer Drive
Oak Ridge, Tennessee 37830

Dr. Linda W. Little
Atomic Safety and Licensing Board
Panel
5000 Hermitage Drive
Raleigh, North Carolina 27612

James M. Cutchin, IV, Esquire (2)
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docketing and Service Section (3)
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

John A. Levin, Esquire
Assistant Counsel
Pennsylvania Public Utility Commission
P.O. Box 3265
Harrisburg, Pennsylvania 17120

Robert Adler, Esquire
Assistant Attorney General
505 Executive House
P.O. Box 2357
Harrisburg, Pennsylvania 17120

John E. Minnich
Chairman, Dauphin County Board
of Commissioners
Dauphin County Courthouse
Front and Market Streets
Harrisburg, Pennsylvania 17101

Walter W. Cohen, Esquire
Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, Pennsylvania 17127

Jordan D. Cunningham, Esquire
2320 North Second Street
Harrisburg, Pennsylvania 17110

Ms. Louise Bradford
TMI ALERT
1011 Green Street
Harrisburg, Pennsylvania 17102

Joseph R. Gray, Esquire (2)
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Ellyn R. Weiss, Esquire
Harmon & Weiss
1725 Eye Street, N.W., Suite 506
Washington, D.C. 20006

Steven C. Sholly
Union of Concerned Scientists
1346 Connecticut Avenue, N.W., Suite 1101
Washington, D.C. 20036

Gail B. Phelps
ANGRY
245 West Philadelphia Street
York, Pennsylvania 17404

William S. Jordan, III, Esquire
Harmon & Weiss
1725 Eye Street, N.W., Suite 506
Washington, D.C. 20006

Robert Q. Pollard
609 Montpelier Street
Baltimore, Maryland 21218

Chauncey Kepford
Judith H. Johnsrud
Environmental Coalition on Nuclear Power
433 Orlando Avenue
State College, Pennsylvania 16801

Marvin I. Lewis
6504 Bradford Terrace
Philadelphia, Pennsylvania 19149

Marjorie M. Aamodt
R. D. 5
Coatesville, Pennsylvania 19320

Thomas J. Germaine, Esquire
Deputy Attorney General
Division of Law - Room 316
1100 Raymond Boulevard
Newark, New Jersey 07102