March 25, 1983
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Appeal Board

In the Matter of	)	
	)	
LOUISIANA POWER & LIGHT COMPANY	)	Docket No. 50-382
	)	
(Waterford Steam Electric Station, Unit 3)	)	

APPLICANT'S BRIEF IN OPPOSITION TO JOINT INTERVENORS' EXCEPTIONS

SHAW, PITTMAN, POTTS & TROWBRIDGE

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TABLE OF CONTENTS

TABLE OF AUTHORITIES

CASES — Page

NRC DECISIONS

Page

MISCELLANEOUS

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Louisiana Power & Light Company ("Applicant") submits this brief in opposition to the exceptions and supporting brief filed by Save Our Wetlands, Inc. and Oystershell Alliance ("Joint Intervenors").1/

I. INTRODUCTION

This appeal grows out of the operating license proceeding for the Waterford Steam Electric Station, Unit 3, located on the west bank of the Mississippi River in St. Charles Parish, Louisiana. Joint Intervenors were permitted to intervene in the proceeding, and they proposed to litigate a number of contentions. Ultimately, two contentions remained for the

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1/ Save Our Wetlands, Inc. and Oystershell Alliance have participated jointly throughout this proceeding and have been denominated as "Joint Intervenors."

evidentiary hearing -- Contention 8/9 (synergism) and Contention 17/26 (emergency planning), which is actually a series of contentions designated Contentions 17/26(1)(a)-(f) and 17/26(2). The hearing was held in New Orleans, Louisiana, over the course of seventeen days in March, April and May of 1982. By orders dated August 17, 1982 and October 18, 1982, the Licensing Board reopened the record for the limited purpose of taking evidence on the adequacy of Applicant's pre-emergency public information brochure. The reopened hearing on this subject was held on February 8-11, 1983, and Applicant has recently filed its proposed findings of fact and conclusions of law concerning the public information brochure. The proposed findings and conclusions of the other parties are due shortly.

On November 3, 1982, the Licensing Board issued a Partial Initial Decision ("PID") disposing of all issues in the proceeding except for the adequacy of the public information brochure. The Licensing Board concluded that an operating license should be issued to Applicant, subject to certain license conditions and subject to the outcome of the reopened hearing on the public information brochure. On December 27, 1982, Joint Intervenors filed a document containing 86 exceptions to the Licensing Board's PID.2/ Joint Intervenors served

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2/ On November 17, 1982, the Appeal Board issued an order extending the time for filing exceptions until 5 days after service of an order by the Licensing Board disposing of a motion for reconsideration previously filed by Applicant. That Licensing Board order was served on December 15, 1982.

their brief in support of their exceptions on February 4, 1983. Applicant's time to file an opposition brief was extended to March 25, 1983 by an Appeal Board order dated February 28, 1983.

Before addressing Joint Intervenors' arguments in detail, we pause to discuss two important procedural matters. First, Appeal Board decisions have clearly established that unbriefed exceptions are considered waived and should be disregarded. See, e.g., Public Service Electric & Gas Co. (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 N.R.C. 43, 49-50 (1981), aff'd sub nom. Township of Lower Alloways Creek v. Public Service Electric & Gas Co., 687 F.2d 732 (3d Cir. 1982); Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-461, 7 N.R.C. 313, 315 (1978). Joint Intervenors have failed entirely to brief a large number of their exceptions,3/ and Applicant submits that the unbriefed exceptions should be dismissed. In any event, Applicant has not attempted here to respond to any of Joint Intervenors' unbriefed exceptions. See Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-409, 5 N.R.C. 1391, 1395 (1977) (appellee's obligation is to respond to appellant's brief, not to his exceptions).

3/ Joint Intervenors' unbriefed exceptions are Nos. 1, 2, 3, 4, 5, 6, 7, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 29, 30, 33, 34, 35, 36 and 37.

Second, Joint Intervenors have disregarded the requirement of 10 C.F.R. § 2.762(a) that, "with respect to each exception," the appellant's brief "shall specify, inter alia, the precise portion of the record relied upon in support of the assertion of error." The Appeal Board has often reiterated the strict requirement that an appellant must cite record evidence in support of the assertions made in his brief. See, e.g., Pennsylvania Power & Light Co. (Susquehanna Steam Electric Station, Units 1 and 2), ALAB-693, slip opinion at 5 (Sept. 28, 1982); Duke Power Co. (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 N.R.C. 453, 480-81 (1982). In this case, large portions of Joint Intervenors' brief are entirely unsupported by any citation to the record. In numerous other places, Joint Intervenors cite only the Licensing Board's findings of fact and/or their own exceptions, neither of which is an adequate substitute for precise references to record evidence. In other places, Joint Intervenors cite and rely upon material that is not in the record, which is clearly improper. See Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-463, 7 N.R.C. 341, 352 (1978); Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-459, 7 N.R.C. 179, 191 (1978) (citations to extra-record material "are so much waste ink"). Joint

Intervenors also made many of the same unsupported assertions before the Licensing Board, and were properly chastised for taking liberties with the evidentiary record. PID at 36 n.24. Applicant believes that the Appeal Board should disregard all assertions in Joint Intervenors' brief that are not supported by proper citations to evidence actually in the record.4/

Set forth below is Applicant's detailed response to the arguments made in Joint Intervenors' brief. Joint Intervenors' brief on Contention 8/9 is not organized and keyed to exceptions or groups of exceptions. Instead, references to the exceptions are simply scattered like citations throughout the brief. Our response is therefore focused on the arguments made in Joint Intervenors' brief rather than on their exceptions. With respect to Contention 17/26, Joint Intervenors' brief deals more directly with their exceptions, and our response is likewise so organized. We deal first with Contention 8/9 (synergism) and then with Contention 17/26 (emergency planning).

4/ The passages where Joint Intervenors have cited nothing or their own exceptions or the Licensing Board's findings of fact are self-evident on the face of Joint Intervenors' brief. In the detailed discussion below, Applicant will specifically point out the places where Joint Intervenors have relied on extra-record material.

II. CONTENTION 8/9 (SYNERGISM)

Joint Intervenors' Contention 8/9 is as follows:

> Applicant has failed to properly evaluate the cumulative and/or synergistic effects of low level radiation with environmental pollutants, known or suspected to be carcinogens.

It is Joint Intervenors' position, in essence, that the low-level radiation released during normal operation of Waterford 3 will interact cumulatively or synergistically with existing chemical carcinogens in the surrounding environment and will produce significant deleterious health effects -- particularly cancer -- in the general population.5/ The Licensing Board rejected Contention 8/9. The Board noted that normal operation of Waterford 3 will add only about 0.01 mrem per year to the 80 mrem per year of natural background radiation in the areas around the plant. PID at 30. From the

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5/ Although Contention 8/9 refers to both "cumulative" and "synergistic" effects, the evidence at the hearing was addressed mostly to synergistic effects. As the Licensing Board pointed out, if the effects of radiation and chemical carcinogens are merely additive or cumulative, then the effects of the radiation are no greater than they would be in the absence of the chemicals. PID at 25 n.17. The effects of radiation alone were adequately considered by Applicant and Staff. Id. Accordingly, the Board's decision does not deal separately with cumulative effects, but focuses instead on synergistic effects. Id. We do not understand Joint Intervenors' brief to be challenging this approach by the Licensing Board.

evidence presented, the Board was unable to conclude that synergistic effects will occur at all as a result of such low levels of radiation. Id. The Board further concluded that even if synergism does occur, the addition of minute doses of radiation from Waterford 3 could only add a correspondingly minute synergistic effect to the synergism that, by Joint Intervenors' hypothesis, must already be occurring between the chemical carcinogens and natural background radiation in the area. Id. The Board reinforced its conclusion by pointing out that the radiation released by Waterford 3 will be smaller even than the variation in natural background radiation from place to place in the area around the plant. Id. at 30-31. Thus the synergistic effects induced by Waterford 3, if they occur at all, will be completely masked by the variations in background radiation and will be clinically undetectable. Id. at 31. Accordingly, the Board found no merit in Joint Intervenors' Contention 8/9.

Joint Intervenors' attack on the Licensing Board's conclusion is divided into six separate arguments. We address each argument in turn below.

A. Credibility and Qualifications of Applicant and Staff Witnesses

The first section of Joint Intervenors' brief (pp. 2-9) appears to be a general attack on the credibility, competence and qualifications of the witnesses who testified on behalf of Applicant and the Staff. Joint Intervenors complain that these witnesses are members of "the incestuous radiation protection community" and that they have "a pecuniary interest in nuclear power and radiation." Joint Intervenors' Brief ("J/I Br.") at 3, 2.6/ They also make more specific challenges to three of the witnesses: John Mauro and Leonard Hamilton, who both testified for Applicant, and Marvin Goldman, who testified for the Staff.7/ We consider each witness separately below.

6/ The Appeal Board has held that an expert's testimony should not be disregarded simply because he received a fee for testifying in the proceeding at hand. Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-248, 8 A.E.C. 957, 967 (1974). It follows a fortiori that an expert's opinion should not be disregarded merely because of a generalized allegation that he has a "pecuniary interest" in the nuclear power industry.

7/ Joint Intervenors devote a two-sentence paragraph to Applicant's witness Ralph Kenning, who is the Health Physics Superintendent at Waterford 3 and who testified concerning the natural background radiation levels actually measured in the areas around the plant. See Applicant's Testimony on Joint Intervenors' Contention 8/9 (Leonard D. Hamilton/John J. Mauro/Ralph Kenning), following Tr. 461, at 7-8 & Table 3 (hereinafter cited as "Hamilton, et al."). Joint Intervenors claim that Mr. Kenning failed to "verify" the radiation readings. J/I Br. at 3. Joint Intervenors did not make this argument before the Licensing Board, and therefore they cannot

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1. John Mauro. Dr. Mauro holds a doctorate in health physics from New York University and is certified by the American Board of Health Physics. Hamilton, et al., at 3. He is the manager of the Radiological Assessment Department of Ebasco Services, Inc., which is the architect/engineer for Waterford 3. Id. Dr. Mauro has been involved over the last eight years in assessing the off-site radiation doses that can be expected from Waterford 3. Id. He calculated that the average dose to an individual in the area around Waterford 3 will be less than 0.01 mrem per year. Id. at 5-7 and Table 2.

Joint Intervenors' attack on Dr. Mauro's testimony is little short of outrageous.8/ For example, Joint Intervenors assert, without citation to the record, that Dr. Mauro "has never taken a biology course," and that the Licensing Board's decision rests upon "the shakey [sic] foundation of a nuclear contractor's employee who has never taken a biology course

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(Continued)

properly raise it here. Public Service Electric & Gas Co. (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 N.R.C. 43, 49 (1981). In any event, Mr. Kenning did verify his readings by ascertaining that they compared closely with those taken independently by the State of Louisiana. Tr. 711-12 (Kenning).

8/ It is also an attack that, for the most part, was never made below and therefore cannot be properly made here. Public Service Electric & Gas Co., supra n.7.

. . . ." J/I Br. at 2-3. Yet the cross-examination of Dr. Mauro was as follows:

> Q. [By Mr. Jones] How do you define the field of Health Physics?
>
> A. [By Dr. Mauro] It's the profession of the study of the health effects of radiation and the protection of man from radiation exposures.
>
> Q. Are you required to take any biology courses in the course of receiving these degrees?
>
> A. Yes, sir.
>
> Q. How many hours of graduate biology courses did you take, approximately?
>
> A. About 45 credits.

Tr. 480 (Mauro). Dr. Mauro's statement of qualifications attached to his prefiled testimony further reflects that he has a B.S. degree in Biology from Long Island University and an M.S. degree in Biology/Health Physics from New York University. See Hamilton, et al., attachment. Thus Joint Intervenors have grossly misrepresented the clear evidence in the record.

Similarly, Joint Intervenors assert that Dr. Mauro "never previously testified at an operating license hearing and more importantly has never confirmed emissions at any operating plant." J/I Br. at 2 (emphasis in original). The pertinence of Dr. Mauro's prior experience as a witness is not immediately apparent. Nevertheless, the record is clear that although

Waterford 3 is the first operating license proceeding in which Dr. Mauro has testified, he did testify in at least three construction permit proceedings. Tr. 516-19 (Mauro). Furthermore, it is misleading to suggest that Dr. Mauro has never confirmed his source term estimates at operating plants. His estimates for Waterford 3 were based on the Gale Code, which is used widely by the nuclear industry and the NRC and which itself is derived from operating experience. Tr. 491-92 (Mauro). In addition, Dr. Mauro independently checked his release estimates for Waterford 3 and found them to be in close agreement with recent operating experience at other plants. Tr. 492-93 (Mauro).

Joint Intervenors also claim that Dr. Mauro's dose calculations omitted consideration of food and drinking water pathways. J/I Br. at 2. This assertion is preposterous. Throughout his testimony, Dr. Mauro repeatedly discussed the role that these exposure pathways play in his dose calculations. See, e.g., Hamilton, et al., at 4-5; Tr. 498, 501-02, 521-22, 604-05 (Mauro).

2. Leonard Hamilton. Dr. Hamilton holds a doctorate in experimental pathology from Cambridge University and an M.D. degree from Oxford University. Hamilton, et al., at 9. He has been involved in assessing the risks of radiation for 35 years

and is currently the head of the Biomedical and Environmental Assessment Division in the National Center for Analysis of Energy Systems at Brookhaven National Laboratory. Id. He testified, in substance, that the tiny incremental addition of low-level radiation from Waterford 3 could not meaningfully increase any cumulative and/or synergistic effects that are already occurring as a result of interactions between environmental pollutants and the existing natural background radiation. Id. at 9-15.

Joint Intervenors attempt to undermine Dr. Hamilton's credibility with baseless accusations regarding his qualifications and objectivity.9/ They claim that no evidence has been presented showing that Dr. Hamilton's scientific papers "have ever passed peer review," and they rely for this proposition upon Index Medicus, a publication that is not in the record and cannot properly be considered by the Appeal Board. J/I Br. at 3. Dr. Hamilton was not cross-examined on his

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9/ We note that the Appeal Board has previously recognized Dr. Hamilton's outstanding qualifications in the field of radiation health effects. In Philadelphia Electric Co. (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-654, 14 N.R.C. 632, 634-35 & n.6 (1981), the Board described Dr. Hamilton as a "highly qualified expert witness" with "impressive qualifications." In a later opinion in the same proceeding, the Appeal Board found that "Dr. Hamilton's expert qualifications in the appraisal of radiation health risks are beyond cavil." ALAB-701, Slip opinion at 16 (Nov. 19, 1982).

publications, and it is too late now to attempt to impeach his statement of qualifications, which is in evidence, with assertions unsupported by anything in the record. See Hamilton, et al., attachment.10/

Regarding his objectivity, Joint Intervenors assert that Dr. Hamilton "displayed selective amnesia in attempting to cover up the extent of his involvement with the nuclear industry." J/I Br. at 3. Nothing in the record suggests that Dr. Hamilton had "selective amnesia." Dr. Hamilton stated that he has indeed testified for other utilities in the past, and he also pointed out that his work is broadly supported by the Department of Energy and the Environmental Protection Agency and that his group has assisted the New York Sierra Club and several heart and lung associations. Tr. 533-36 (Hamilton). Furthermore, Dr. Hamilton has never taken a position for or against the licensing of a particular plant, but has simply

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10/ Joint Intervenors also contend that Dr. Hamilton should not have been permitted to testify about the causes of cancer in southern Louisiana. J/I Br. at 4. The cross-examination of Dr. Hamilton showed that he was fully familiar with this subject and competent to testify about it. He stated that he reviewed the literature concerning environmental pollutants in southern Louisiana, including the studies cited by Joint Intervenors' witnesses and studies not cited by Joint Intervenors. Tr. 644 (Hamilton). Dr. Hamilton demonstrated his familiarity with the literature when he discussed at some length a number of papers on this subject. See, e.g., Tr. 645-55, 658-72, 674-79 (Hamilton).

given his opinions on the scientific facts about which he was asked. Tr. 540 (Hamilton). Clearly, there is no evidence of bias or lack of objectivity on the part of Dr. Hamilton.

Joint Intervenors also argue that when Dr. Hamilton states that the radiation added by Waterford 3 will be only a "tiny fraction" of the existing natural background radiation (Hamilton, et al., at 10), he "apparently does not know the exact figures to which he refers as 'tiny' and nowhere in his testimony offers a specific amount in rems or percentage of background radiation." J/I Br. at 4. Joint Intervenors' assertion is patently false. Dr Hamilton's direct testimony was part of a panel presentation that included Table 2, showing the calculated average annual individual dose of 0.01 mrem resulting from routine operation of Waterford 3. Dr. Hamilton referred specifically to this average dose of 0.01 mrem several times during his testimony. Tr. 637, 639, 683, 716 (Hamilton). Table 3 to the panel's direct testimony showed the natural background radiation from external sources at various locations around Waterford 3; the measured doses vary from 69.2 to 88.48 mrem per year. Dr. Hamilton also noted that the background radiation from internal and external sources would total approximately 100 mrem per year, and that the external background radiation varies by as much as 20 mrem per year around Waterford 3. Hamilton, et al., at 15; Tr. 683, 715 (Hamilton).

It is apparent that Dr. Hamilton in fact was familiar with the average dose expected from Waterford 3 and that this dose is indeed a "tiny fraction" of the existing background radiation in the area.

Joint Intervenors further claim that the average dose of 0.01 mrem relied upon by Dr. Hamilton is "at serious variance" with an estimate by Staff witness Edward Branagan that the maximally exposed individual could receive a dose of 23 mrem from Waterford 3. J/I Br. at 4. This supposed "variance" is entirely illusory and does not in any way undermine Dr. Hamilton's testimony.

The 23 mrem figure was based upon data in Table J-5 of the Final Environmental Statement ("FES"), which was admitted into evidence as Staff Exhibit No. 1. Tr. 453, 455. Dr. Branagan derived the figure at the request of Joint Intervenors' counsel by adding together the Appendix I Design Objectives for the dose to total body from all pathways for liquid effluents (3 mrem), the dose to total body from noble-gas effluents (5 mrem), and the dose to any organ from all pathways for radioiodines and particulates (15 mrem). Tr. 879-80 (Branagan). It is important to note that these figures represent the Appendix I Design Objectives; they are not the calculated doses that, according to the Staff's FES, the maximally exposed hypothetical individual could theoretically receive from Waterford

3. When Dr. Branagan performed an analogous calculation using the Staff's actual calculated doses to the maximally exposed individual, the result was an annual dose of about 6 mrem. Tr. 1000, 1010 (Branagan). This dose falls well within the variation in natural background radiation in the area around Waterford 3. See Hamilton, et al., at 8. Therefore, the testimony by Dr. Branagan cited by Joint Intervenors further supports Applicant's position that the increase in synergistic effects caused by operation of Waterford 3, if any, will be undetectably small. Id. at 10.

It is also clear from Dr. Branagan's testimony that the maximally exposed individual is a truly hypothetical individual. In order to obtain the annual dose of 6 mrem mentioned by Dr. Branagan, this individual would have to be physically located at the site boundary ESE of the plant 100% of the year, and he would have to be outside and unshielded from gamma radiation 70% of the year. Tr. 747, 1006 (Branagan); FES pp. 5-29, J-6. In addition, the individual would have to eat fish from the plant's discharge canal, eat meat from an animal located 0.8 miles NW of the plant, and eat vegetables from a farm 0.31 mile ESE of the plant. Tr. 1001-02, 1006-08 (Branagan); FES p. J-6. Accordingly, it is highly unlikely that any individual would actually receive all the dose components assumed for the maximally exposed

individual. Tr. 1002, 1014 (Branagan). It is for this reason that the Staff does not ordinarily add up the doses from all of the various exposure pathways to which the maximally exposed individual is hypothetically exposed. Tr. 1008 (Branagan).

In any event, the calculated dose to the hypothetical maximally exposed individual is clearly not the best measure of the health effects from any synergism between the routine radioactive releases from Waterford 3 and existing environmental pollutants. Joint Intervenors' Proposed Conclusion of Law No. 2 submitted to the Licensing Board indicates that their concern is for the health of "thousands of Louisianians" living in a "corridor stretching from Baton Rouge to the mouth of the Mississippi." To address this concern for the general population, it is more realistic to consider the average dose that the general population is actually expected to receive from routine operation of Waterford 3 -- 0.01 mrem per year.11/

Finally, Joint Intervenors take issue with Dr. Hamilton's conclusion that the synergistic and/or cumulative effects caused by Waterford 3 will be undetectably minute because the

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11/ It has been held that for NEPA purposes the assessment of radiological impacts is properly based upon the plant's "actual anticipated release rate, and not upon either its design objectives or maximally permissible rates." Union of Concerned Scientists v. AEC, 499 F.2d 1069, 1091 (D.C. Cir. 1974). Contention 8/9 is, of course, a NEPA contention. See PID at 31 n.19, 70 (Conclusion of Law No. 2.).

radiation released by the plant will be a minute fraction of the existing natural background radiation. J/I Br. at 5-6. Joint Intervenors cite no record evidence in support of their position, and their argument is unpersuasive.

Unlike Joint Intervenors, Applicant has provided evidence to support its position. Dr. Hamilton testified that since the increase in radiation caused by Waterford 3 will be only a tiny fraction of natural background radiation, the increase could not possibly represent any significant additional hazard beyond that to which the population is already exposed. Tr. 716 (Hamilton). He stated that the existing scientific evidence does not provide an adequate basis for extrapolating from synergistic effects shown at high doses down to small doses such as those expected from Waterford 3. Tr. 716-17 (Hamilton). However, he testified that, assuming for reasons of conservatism that synergism does occur even at the lowest conceivable doses, he would expect the results of the addition of the radiation from Waterford 3 to be directly proportional to the increase in dose of radiation. Tr. 717 (Hamilton). Moreover, Dr. Hamilton believes that his conclusion is conservative because of two assumptions: (1) that synergistic and/or cumulative effects do in fact occur at low levels of radiation such as those involved in this case;12/ and (2) that the body's

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12/ It is important not to lose sight of the fact that the preponderance of the evidence in this record indicates that

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normal radiation repair mechanism is to be disregarded. Tr. 716-19 (Hamilton). By ignoring the repair mechanism and assuming a linear dose-effect curve, Dr. Hamilton believes that we will arrive at an upper-boundary risk estimate that in fact overstates the actual risk, including any additional risk resulting from the synergistic and/or cumulative interactions that may be occurring at these low levels of radiation. Tr. 719 (Hamilton).

The testimony of Applicant's rebuttal witness Jacob Fabrikant provides further support for Dr. Hamilton's conclusions. Dr. Fabrikant testified that attempts have been made to extrapolate down linearly from experiments showing synergism at high doses to low doses such as those involved here. Tr. 3647 (Fabrikant). In his view, these efforts have not been particularly useful. Id. Dr. Fabrikant went on to testify, however, that in his opinion synergistic effects would not occur at all at low levels of radiation and that if they did occur, the effects would be so small as to be clinically undetectable. Tr. 3656-57 (Fabrikant).

(Continued)

synergism will not occur at all at the low levels of radiation involved in this case. See, e.g., Tr. 716-19 (Hamilton); Tr. 3656-57 (Fabrikant); NRC Staff Testimony of Dr. Marvin Goldman Regarding Contention 8/9, following Tr. 735, at 3, 14-15 (hereinafter cited as "Goldman"); Tr. 945, 987-89 (Goldman).

The only evidence cited by Joint Intervenors to support their argument is the BEIR I Report13/ and in particular the following passage:

> [B]ecause there is greater killing of susceptible cells at high doses and high dose rates, extrapolation based on effects observed under these exposure conditions may be postulated to underestimate the risks of irradiation at low doses and low dose rates.

BEIR I, at 88. From this, Joint Intervenors argue that linear dose-effect curves underestimate the actual risk. J/I Br. at 6-7. However, the passage quoted by Joint Intervenors is but the last sentence of a long paragraph in BEIR I. The entire pertinent portion of the paragraph states as follows:

> At background radiation levels, ionizing events in individual mammalian cell nuclei occur at a rate of much less than one per day, whereas at the higher dose rates mentioned, ionization events occur in cells at a frequency of the order of 2600 per second. This enormous difference may have important implications with respect to the production of radiation damage within cells and its repair at the molecular level. On the basis of the likelihood of such repair, the risk of cancer induction at low doses and low dose rates might be expected to be appreciably smaller per unit dose than at high doses and high dose rates, as has been

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13/ National Academy of Sciences/National Research Council, The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: Report of the Advisory Committee on the Biological Effects of Ionizing Radiations (Nov. 1972) (hereinafter "BEIR I"). The BEIR I Report was not offered or admitted into evidence.

> observed to be the case in certain radiation-induced tumors of experimental animals. 5, 10, 19. Hence, expectations based on linear extrapolation from the known effects in man of larger doses delivered at high dose rates in the range of rising dose-incidence relationship may well overestimate the risks of low-LET radiation at low dose rates and may, therefore, be regarded as upper limits of risk for low-level low-LET irradiation. The lower limit, depending on the shape of the dose-incidence curve for low-LET radiation and the efficiency of repair processes in counteracting carcinogenic effects, could be appreciably smaller (the possibility of zero is not excluded by the data). On the other hand, because there is greater killing of susceptible cells at high doses and high dose rates, extrapolation based on effects observed under these exposure conditions may be postulated to underestimate the risks of irradiation at low doses and low dose rates.

BEIR I, at 88 (emphasis added). The crucial point here is that risk estimates are not derived from those portions of the curves where there is greater killing of susceptible cells. They are derived from the linear, i.e. rising, portion of the curves only. This caveat was included by the BEIR Committee to emphasize the well-known fact of cell-killing by ionizing radiation at high doses and the hazards of extrapolating from such situations. The last sentence does not undermine the basic conclusion that extrapolation downward from the linear portion of the dose-effect curve probably overstates the actual risk.

3. Marvin Goldman. Dr. Goldman holds a doctorate degree in Radiation Biology and is currently a Professor of Radiobiology at the University of California, Davis, and Director of the University's Laboratory for Energy-Related Health Research. Goldman at 1 and attachment. He has had over 30 years of experience in radiation research and has authored over 100 papers on radiation-related topics. Id. He testified on behalf of the Staff that cumulative and synergistic effects probably will not occur as a result of the extremely low levels of radiation that Waterford 3 is expected to release. Id. at 3, 14-15.

Joint Intervenors' criticism of Dr. Goldman's testimony concentrates on two studies relating to the interaction of chemicals and radiation: Kennedy, et al., "Enhancement of X-ray Transformation by 12-O-Tetradecanoyl-phorbol-12-acetate in a Cloned Line of C3H Mouse Embryo Cells," Cancer Research 38:439 (1978); and DiPaolo, et al., "X-Irradiation Enhancement of Transformation by Benzo(a)Pyrene in Hamster Embryo Cells," Proceedings of the National Academy of Sciences 68:1734 (1971). J/I Br. at 7-9. From this material, Joint Intervenors incorrectly conclude that synergistic interactions do in fact occur at low levels of radiation. As discussed below, Dr. Goldman's testimony proves that their conclusion is not warranted by the evidence cited.

The Kennedy study, according to Joint Intervenors, showed that the chemical agent enhanced transformation most effectively at low doses of radiation. J/I Br. at 7-8.14/ Dr. Goldman stated in his testimony, however, that Kennedy was unable to get any transformations without 50 to 100 rads, which he regards as a fairly large dose of radiation. Tr. 950 (Goldman). In addition, Dr. Goldman reviewed the range of doses used by Kennedy, from 50 to 600 rads, and concluded that the data were convergent toward no enhancement factor. This suggested to Dr. Goldman a threshold effect, with a radiation level below which no enhancement, or synergism, occurs. Tr. 951-53 (Goldman).

Joint Intervenors contend that the DiPaolo study provides a valid model for low-dose situations such as Waterford 3. J/I Br. at 8-9. Dr. Goldman testified unequivocally that the DiPaolo experiment does not provide an acceptable model for predicting synergism in vivo. Tr. 971-75 (Goldman). More

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14/ In discussing the Kennedy study, Joint Intervenors erroneously quote Dr. Goldman's direct testimony (p. 10) as stating that the maximum enhancement factor was seen in studies "using relatively high radiation doses (20 mrem or more)." J/I Br. at 7. The parenthetical in Dr. Goldman's testimony actually states "(25 rem or more)." We assume that this was a typographical error, although the identical error appeared in Joint Intervenors' Proposed Findings of Fact (FF 47), and Applicant pointed out the error in its reply findings. See Applicant's Reply To Joint Intervenors' Proposed Findings on Contention 8/9 (Synergism), at 33-34 n.12 (July 26, 1982).

significantly, the DiPaolo data suggest, as Dr. Goldman noted, that synergistic effects diminish exponentially as the radiation dose goes down. Tr. 971-72 (Goldman).

In summary, the studies discussed by Joint Intervenors do not undermine but rather support the testimony given by Dr. Goldman in this proceeding. In particular, the studies support Dr. Goldman's opinion that synergism probably does not occur at all at low levels of radiation such as those expected from Waterford 3. Goldman at 3, 14-15; Tr. 945, 987-89.

B. Failure to Consider Testimony of Joint Intervenors' Witnesses

In the second section of their brief, Joint Intervenors argue that the Licensing Board did not adequately consider or address the testimony of their witnesses. J/I Br. at 10-22. Their argument is wholly without merit. The Licensing Board heard all the evidence, and its decision addresses and rejects all of the major points made by Joint Intervenors. See PID at 25-31, 64-69. It is true that the Board's decision did not discuss each and every argument and proposed finding submitted by Joint Intervenors; nor did it discuss in detail the testimony of any of the witnesses.15/ But the law does not require

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15/ The format and level of detail in the Licensing Board's decision appear to be consistent with a memorandum dated

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any such detailed treatment of the parties' evidence or arguments. In Columbia Transportation Co. v. United States, 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 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.

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 Co. (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 Co. of New Hampshire

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December 22, 1981 from Chief Administrative Judge B. Paul Cotter, Jr., to all Licensing Board Panel members concerning a recommended new format for initial decisions.

(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 & Co. Transports v. United States, 314 F. Supp. 1036, 1042 (W.D. Mo. 1970) (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 here meets these standards.

With this background, we now turn to the specific arguments made by Joint Intervenors about the consideration and weight that should have been given to three of their witnesses: Velma Campbell, Carl Johnson and Irwin Bross.16/ We will

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16/ Joint Intervenors also presented a fourth witness, Dr. Hemchandra Pandit, but they do not appear to be arguing that the Licensing Board improperly slighted his testimony. In any event, Dr. Pandit's expertise appears to lie primarily in the field of reptile physiology. See Joint Intervenors' Exhibit No. 31 (Dr. Pandit's resume), admitted at Tr. 1344. Indeed, Dr. Pandit has never published a paper in which the term "radiation" appears. Tr. 1139 (Pandit). The Licensing Board nevertheless found Dr. Pandit to be qualified, "at least marginally," to testify as an expert. Tr. 1217.

discuss each witness in turn.

1. Velma Campbell. Dr. Campbell is a New Orleans physician specializing in Family Medicine; she testified about the incidence and possible causes of cancer in southern Louisiana. See Sworn Testimony of Dr. Velma L. Campbell, following Tr. 1055 (hereinafter cited as "Campbell"). The portion of Joint Intervenors' brief (pp. 10-15) dealing with Dr. Campbell's testimony is notable for its improper reliance on extra-record material. For example, Dr. Campbell admitted on voir dire that she has no expertise or experience in radiation physics, radiation health or radiation safety. Tr. 1040 (Campbell). Accordingly, the parties stipulated that all references to radiation health effects -- synergistic or otherwise -- should be stricken from Dr. Campbell's prefiled testimony. Tr. 1053-55. Joint Intervenors now attempt in their brief to resurrect the stricken testimony of Dr. Campbell concerning radiation health effects. See J/I Br. at 10 (lines 13-15), at 15 (lines 4-7, 13-19). This section of Joint Intervenors' brief also discusses and relies upon two studies that are not in the record -- the "Harris report" and "a 1972 study." See J/I Br. at 11 (lines 3-16). In addition, their brief repeatedly cites a sworn statement by Dr. Samuel Epstein. J/I Br. at 10, 11, 14, 15. This statement was submitted as a

limited appearance statement (Tr. 436-50) and therefore does not constitute evidence. Iowa Electric Light & Power Co. (Duane Arnold Energy Center), ALAB-108, 6 A.E.C. 195, 196 n.4 (1973).

When all of the improper references to extra-record material are stripped away, the most that can be gleaned from Dr. Campbell's testimony is that some data show above-average rates for some types of cancer in the New Orleans area and that some studies show associations between some types of cancer and some environmental pollutants. There is also contrary evidence in the record -- both as to the cancer rates in Louisiana17/ and as to the causal relationship between the cancer rates and environmental pollutants.18/

Applicant submits that the Licensing Board's decision fairly and accurately reflects the evidence actually in the record on these points, including the uncertainties and ambiguities of the evidence. See PID at 28-29, 66-67. In any

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17/ See Tr. 2093-94, 2097-98, 2100-01, 2113-18 (Campbell) (discussion of American Cancer Society statistics showing Louisiana cancer rates below national average or only slightly above it).

18/ See Tr. 2066-68, 2070-71 (Campbell) (discussion of inherent limitations of studies cited by Dr. Campbell); Tr. 652-55, 658-67 (Hamilton) (discussion of studies not cited by Dr. Campbell casting doubt on the proposition that cancer is caused by chemicals in the drinking water in southern Louisiana).

event, the Board's conclusions on the cancer rates and their causes are hardly central to the ultimate disposition of Contention 8/9. Dr. Hamilton testified, and the Board found, that the present Louisiana cancer rates must necessarily reflect any synergistic interactions occurring between chemical carcinogens and the natural background radiation in the area. Hamilton, et al., at 14-15; PID at 30, 69. Whatever the existing cancer rates, the addition of 0.01 mrem from Waterford 3 cannot increase significantly the synergistic effects that, by hypothesis, are already occurring as a result of the approximately 100 mrem of background radiation in the area around the plant.

2. Carl Johnson. Joint Intervenors believe that the Licensing Board improperly disregarded testimony by Dr. Johnson challenging Applicant and Staff estimates of the radioactive releases from Waterford 3 and the resulting health effects. J/I Br. at 16-18. Cross-examination revealed, however, that Dr. Johnson had no substantial basis for his opinions, and his testimony is therefore entitled to little or no weight.

For example, Dr. Johnson has never performed source term or dose calculations for Waterford 3 or any other commercial light water reactor, and he does not consider himself an expert

in these areas. Tr. 1852-54, 1886-87, 1947 (Johnson). Accordingly, Dr. Johnson's views on this subject are of little value. Similarly, Joint Intervenors rely on Dr. Johnson's testimony to argue that there is a high water table in Louisiana that will result in special risks associated with ground water radionuclide contamination. J/I Br. at 16. Dr. Johnson has made no study of the hydrology or geology in the area around Waterford 3, and he is not familiar with the aquifers, aquicludes or sources of drinking water in the area. Tr. 1964-65 (Johnson). By contrast, the Staff has studied this subject in some detail and does not share Dr. Johnson's views. See FES (Staff Ex. 1) § 5.3.1. Dr. Johnson's opinions clearly lack any real factual foundation.19/ They are entitled to no weight.

Joint Intervenors further doubt that the actual exposures at Waterford 3 will be as low as predicted, especially in view

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19/ There is likewise no basis for the suggestion that the inhalation and ingestion pathways for radiation exposure have been poorly evaluated. See J/I Br. at 16. Applicant's dose calculations take into consideration the inhalation and ingestion pathways, including ingestion of vegetables, beef, milk, water and aquatic foods. Hamilton, et al., at 5; Tr. 498, 501-02, 521, 604-05 (Mauro). The Staff's dose calculations are based on Regulatory Guide 1.109, which contains equations and detailed data for modeling the inhalation and ingestion pathways. See NRC Staff Testimony of Edward F. Branagan, Jr. Regarding Contention 8/9, following Tr. 767, at 5 (hereinafter cited as "Branagan"); FES (Staff Ex. 1) § 5.9.1 and Appendix J.

of the 240 radionuclides that, Dr. Johnson testified initially, are routinely released from nuclear power plants. See J/I Br. at 16-17. On cross-examination, Dr. Johnson admitted that the 240 radionuclides were taken from a Health Physics article listing dose conversion factors for all the radionuclides associated with the entire nuclear fuel cycle. Tr. 1937-39 (Johnson). This listing says nothing about the radionuclides that will be released from Waterford 3 or any other commercial light water reactor.

Joint Intervenors assert that Dr. Johnson has seen records of large radioactive releases from five reactors and that these "published releases are considerably higher than the proposed releases of the Waterford 3 plant." J/I Br. at 18. During his cross-examination, Dr. Johnson referred to a table he prepared showing releases from Oyster Creek and from Westinghouse, Combustion Engineering, Babcock and Wilcox and General Electric plants. Dr. Johnson's table is not in the record, and, for the reasons discussed below, it cannot be regarded as a reliable representation of actual plant releases.

Dr. Johnson testified that the figures for Oyster Creek were derived from an EPA report. Tr. 1909-10 (Johnson). He tabulated figures for the manufacturers from numbers in a report prepared by J. C. Malaro and T. H. Essig, entitled "Doses from Radioactive Actinides Released in Liquid Effluents

from Light Water Cooled Nuclear Power Reactors." Tr. 1986 (Johnson). Contrary to Joint Intervenors' statement at pages 17-18 of their brief, Dr. Johnson did not receive NRC figures for releases from the exhaust plume. Tr. 1911 (Johnson). Dr. Johnson believes that the figures on his table represent releases from single reactors made by the listed manufacturers, but he could not name the plants. Tr. 1986-89 (Johnson). Nor did he recall whether the numbers on his table are based on actual releases or projections of releases or what differences exist between the plants. Tr. 1904, 1912 (Johnson).

Dr. Johnson understands Waterford 3 to be a PWR manufactured by Combustion Engineering, but he did not know whether Combustion Engineering has more than one type of reactor design or effluent treatment system. Tr. 1989 (Johnson). His table showed a Combustion Engineering plant that releases 10 million picocuries of Neptunium 239. He acknowledged that the Staff's corrected estimate projects releases of 30 million picocuries of Neptunium 239 from Waterford 3, which is three times greater than the Combustion Engineering plant releases represented on his table. Tr. 1989-92 (Johnson). Thus, Dr. Johnson's table suggests, if anything, that the Staff's estimates are conservative.

Dr. Johnson's only evidence from an operating plant that the Staff's estimate may be inaccurate is a comparison of that

estimate to the releases from Oyster Creek. He admitted that Oyster Creek is a BWR and that he does not know the manufacturer or the type of effluent treatment system used at that plant. Tr. 1992-93 (Johnson). He recognized the wide disparity among the calculated releases from plants represented on his table and that different release rates may be expected from various systems. Tr. 1993 (Johnson).

Dr. Johnson's comparison of his representation of widely varying release rates attributed to different types of plants with the projected releases from Waterford 3 is meaningless. There is no persuasive evidence in the record to support Joint Intervenors' statement that "published releases are considerably higher than the proposed releases of the Waterford 3 plant." J/I Br. at 18.

In the final analysis, it was Dr. Johnson's view that operating experience at existing nuclear power plants is the best measure of the releases to be expected from a new plant coming on-line. Tr. 1877 (Johnson). Applicant's estimates of the releases expected from Waterford 3 were made by using mathematical models that are based on operating experience at other plants around the country. Tr. 490-94 (Mauro). As discussed previously, Dr. Mauro independently checked his release estimates for Waterford 3 and found them to be in close agreement with recent operating experience at other plants.

Id. at 492-93. Thus, even by Dr. Johnson's standards, the source terms calculated for Waterford 3 are reasonable estimates of the source terms that may be expected during plant operation.

3. Irwin Bross. Joint Intervenors also complain that the Licensing Board ignored testimony by Dr. Bross to the effect that Applicant and the Staff have underestimated the real health risks of low-level radiation and environmental pollutants. J/I Br. at 19-22.20/ It would hardly be surprising for the Board to be unimpressed with Dr. Bross' testimony, since his work has been thoroughly discredited and rejected by virtually the entire scientific community. For example, Dr. Lauriston Taylor, former president of the National Council on Radiation Protection, has stated of Dr. Bross that "his few published articles on the subject [radiation health effects] have been thoroughly and competently demolished by his scientific peers." Tr. 1637 (Bross).21/

20/ These four pages in Joint Intervenors' brief are unnumbered. In logical sequence, they should be numbered 19-22, and there would be no page 23. This portion of Joint Intervenors' brief also contains improper references to and quotations from the following extra-record material: Science article and Appendix VI and VII (p. 19, lines 12-14); Hearing Brief, Appendix IV (p. 19, line 22); Wilson, Upton and Stannard (p. 20, lines 11-13); Brodsky (p. 20, lines 17-26); and Department of Commerce (p. 21, lines 9-11).

21/ Dr. Bross was quoting from Dr. Taylor's comments published in Interagency Task Force on the Health Effects of Ionizing

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Similarly, in 1977 Dr. Bross published a paper in the Journal of the American Medical Association (JAMA) entitled "Genetic Damage From Diagnostic Radiation." JAMA 237:2399 (1977). In a subsequent critique of the article published in the same journal, Dr. Charles Land of the National Cancer Institute stated that Dr. Bross' conclusions are "fallacious and will not stand critical examination." Tr. 1604 (Bross), quoting JAMA 238:1023 (1977). Another critique of the same paper was offered by Dr. Bernard Oppenheim of the Indiana University School of Medicine in which he stated that Dr. Bross' "overall reasoning is fallacious," that the paper contains "circular reasoning," and that the "authors' alarming claim regarding the hazards of low-level radiation is therefore not warranted by the evidence they present." Tr. 1605 (Bross), quoting JAMA 238:1024 (1977).

Another article22/ written by Dr. Bross was published with the following extraordinary note by the Editor of the American Journal of Public Health (AJPH):

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Radiation: Public Comments on the Work Group Reports (June 1979).

22/ Bross, et al., "A Dosage Response Curve for the One Rad Range: Adult Risks from Diagnostic Radiation," AJPH 69:130 (1979). This article was admitted into evidence as Joint Intervenors' Exhibit No. 27. Tr. 1336.

EDITOR'S NOTE: The Journal is not given to publishing articles which are not subject to the peer review process. However, the above paper by Dr. Bross and his colleagues is an exception. Its subject matter is of great importance to the public health, yet Dr. Bross stands virtually alone in defense of his data and the interpretations he places on them. Because Dr. Bross has been a respected investigator whose statements are frequently quoted by the press, and because published critiques of his analysis have been rare in both professional journals and the press, the Journal chose to publish the paper he submitted together with a critique of it, p. 137, this issue, thus allowing Journal readers to draw their own conclusions. See also Dr. Carl Johnson's Letter to the Editor, p. 181.

See Tr. 1610-13 (Bross). The critique referred to in the Editor's Note was provided by Drs. Boice and Land of the National Cancer Institute.23/ They stated that Dr. Bross' conclusions "are not justified by the analysis or data reported," that Dr. Bross' paper "stretches the data far beyond reasonable limits to produce unwarranted conclusions," and that "[w]ithout the incorrect statistical manipulations employed by the authors, the analysis would produce estimates so imprecise as to be meaningless." Tr. 1615-20 (Bross).

The recent BEIR III Report24/ discussed the work of Dr.

23/ Boice and Land, "Adult Leukemia Following Diagnostic X-Rays?" AJPH 69:137 (1979).

24/ National Academy of Sciences/National Research Council, Committee on the Biological Effects of Ionizing Radiations, The

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Bross at some length and concluded that "[t]he applications by Bross, et al., have been clearly incorrect and they provide no evidence that the risk of cancer from low-dose radiation is greater than indicated by conventional estimates." Tr. 1628 (Bross), quoting BEIR III at 461.

Many other scientists and scientific groups have likewise criticized Dr. Bross and rejected his work.25/ Suffice it to say that the responsible scientific community has completely repudiated Dr. Bross' work in the field of radiation health effects. In addition, Applicant's two rebuttal witnesses in this proceeding -- George Hutchison and Jacob Fabrikant -- were of the same view. See Applicant's Rebuttal Testimony of George B. Hutchison on Contention 8/9, following Tr. 3411 (hereinafter cited as "Hutchison"); Applicant's Rebuttal Testimony of Jacob I. Fabrikant on Contention 8/9, following Tr. 3627 (hereinafter cited as "Fabrikant"). Dr. Hutchison is a Professor of Epidemiology at the Harvard University School of Public Health;

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Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980.

25/ Others who have severely criticized Dr. Bross' work include Dr. Kenneth Rothman of the Harvard School of Public Health, Tr. 1606-08 (Bross); Professor Hoyt Whipple of the University of Michigan, Tr. 1608-10 (Bross); P. G. Smith, M. C. Pike and L. D. Hamilton of Oxford University, Tr. 1620 (Bross); and NCRP Report No. 64, Tr. 1628-31 (Bross).

he was a member of the BEIR I Committee and is a Board Member of the NCRP. Hutchison at 1. Dr. Hutchison provided a lengthy and critical assessment of portions of Dr. Bross' testimony in this proceeding as well as certain of the exhibits that were admitted under Dr. Bross' sponsorship. Hutchison at 2-32.

Dr. Fabrikant is a Professor of Radiology at the University of California School of Medicine and served on various committees, including the BEIR I, BEIR II and BEIR III Committees and the International Commission on Radiological Protection (ICRP). Fabrikant at 3. Dr. Fabrikant provided a critical evaluation of Dr. Bross' testimony in this proceeding and concluded, inter alia, that "Bross remains discredited; none of his studies is sufficiently extensive, complete, or free of serious methodologic complications to provide conclusive, or even reliable, information at the present time on the health effects of radiation at low doses." Id. at 20. It is little wonder, then, that the Licensing Board did not adopt Dr. Bross' views in this case.

A more detailed examination of Dr. Bross' testimony also shows it to be largely unreliable and without substantial foundation in fact. For example, Joint Intervenors make much of the analogy that Dr. Bross attempted to draw between the Mississippi River and the river systems in the Soviet Union. See J/I Br. at 21, 22. Dr. Bross testified that in Russia

there has been an upswing in infant mortality that he thought could have been caused by a synergistic effect between Russian nuclear power plant releases and chemical carcinogens from other Russian industries, strung like beads along common river systems. See Sworn Statement of Dr. Irwin D. J. Bross, following Tr. 1342, at 10-12 (hereinafter cited as "Bross"). Dr. Bross relies for his postulate about Russian infant mortality on two articles that appeared at some time in the newspaper. The first apparently reported an increase in Russian mortalities; the second, sometime later, provided reasons for the increase, attributed to a Russian statistician. Tr. 1563-64, 1567, 1746-47 (Bross). Dr. Bross' entire opinion stems from these articles. He has never studied Russia's nuclear industry, its river system, its pollutants, its infant mortalities or its reporting systems, and thus was not in a position to apply these elements to comparable parameters in the United States setting generally, or Waterford 3 in particular. Tr. 1565, 1572-79 (Bross). He did nothing to substantiate or investigate the two newspaper articles and the conclusions he drew from the articles. Tr. 1564, 1569-71 (Bross). Dr. Bross offered scant evidence regarding what may be a problem in Russia and a total lack of evidence regarding that possible problem's application to the instant case. The theory that experience in Russia demonstrates synergism and

provides a possible analogy for southern Louisiana after Waterford 3 starts operation is baseless.26/

Similarly, Joint Intervenors refer to a theory by Dr. Bross concerning "break-points" in genetic material and increasing genetic damage from generation to generation through "inheritance of accumulated break-points." J/I Br. at 19. On rebuttal, Dr. Fabrikant completely rejected Dr. Bross' theory and pointed out Dr. Bross' total lack of expertise in this field:

> Dr. Bross by training is a statistician. His testimony overall reflects very limited understanding of biology, biophysics, genetics, medicine, and radiation biology at any level to explain the theories of mechanisms of mutagenesis and/or carcinogenesis at the cellular level and how these mechanisms manifest cancer-induction and/or genetically-related ill-health in the human. His understanding of biological mechanisms and factors of radiation and chemical carcinogenesis as indicated by his testimony is naive and confused. The problems involving both are extremely complex, highly scientific, and in large measure subject to great uncertainty.

Fabrikant at 13; see also Tr. 3567-70, 3578-80 (Fabrikant).

26/ Joint Intervenors also rely on Dr. Pandit's testimony in an attempt to draw an analogy with Love Canal. J/I Br. at 21. Like Dr. Bross, Dr. Pandit's view was unsupported by any evidence or study, and he demonstrated little knowledge of potential synergism in the Love Canal area. See Tr. 1231-38 (Pandit). As to Dr. Pandit's qualifications, see n.16 supra.

In summary, it is Applicant's view that if the Licensing Board gave little weight to Dr. Bross' testimony, the evidence got the weight it deserved.27/

C. Allocation of Burden of Proof

The thrust of the third section in Joint Intervenors' brief (pp. 24-27) is not entirely clear.28/ They appear to be complaining that the Licensing Board improperly shifted to them the burden of proving with mathematical certainty that synergism does occur at low levels of radiation. They believe that the Board should have relied upon studies showing synergism at much higher doses and extrapolated the effects down to the dose levels expected at Waterford 3.29/ Joint Intervenors' argument

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27/ Joint Intervenors also imply that Applicant and the Staff have focused solely on average population doses, that we have ignored reconcentration of radionuclides through the food chains, and that we have not considered susceptible subgroups such as children. J/I Br. at 22. Joint Intervenors are plainly wrong. As discussed at length above, our assessment includes not only average doses, but also the calculated dose to the maximally exposed individual. The dose calculations also assume reconcentration through the food chains. See FES (Staff Ex. 1) § 5.9.1.1.2 and Regulatory Guide 1.109. Finally, the BEIR III risk estimates relied upon by Dr. Hamilton do take into account the variation in risk by age group. See Hamilton, et al., at 11-12; BEIR III Report at 142, 198-211.

28/ This section of Joint Intervenors' brief is notable for its nearly complete lack of any citations to evidence in the record.

29/ The studies showing synergism have been carried out using radiation doses millions of times higher and dose rates

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is wholly without merit.

There is nothing in the record to suggest that the Licensing Board shifted the burden of proof to Joint Intervenors. The Board simply made its findings based on the preponderance of the evidence in the record. One such finding was that the presently available scientific evidence does not support the conclusion that synergism will occur between chemical carcinogens and radiation at the low levels expected from Waterford 3. PID at 68.30/ The evidence supporting that finding was virtually overwhelming. See, e.g., Hamilton, et al., at 13-14; Tr. 716-17 (Hamilton); Goldman at 3, 14-15; Tr. 945, 987-89 (Goldman); Tr. 3656-57 (Fabrikant). Even Joint Intervenors' own witness conceded that he was aware of no studies showing synergism between chemicals and low-level radiation. Tr. 2025 (Johnson).31/

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billions of times higher than the doses and dose rates expected from Waterford 3. See, e.g., Goldman at 10-15; Hamilton, et al., at 13-14.

30/ We note that in a prior NRC case, another licensing board on the evidence before it found no synergistic effects between radiation and pollutants at the levels near those projected for the dose rates due to that plant's releases. Duquesne Light Co. (Beaver Valley Power Station, Unit No. 2), LBP-74-25, 7 A.E.C. 711, 730-31 (1974), aff'd, ALAB-240, 8 A.E.C. 829 (1974).

31/ Joint Intervenors make an assertion in their brief so far-fetched that we cannot allow it to pass unchallenged. They

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Joint Intervenors argue that the Licensing Board should have extrapolated down from high-dose synergism studies to low-dose situations such as Waterford 3. But here again, the Board found, with full support in the record, that such attempts at extrapolation have not been scientifically useful. PID at 68; see Tr. 716-18 (Hamilton); Tr. 3647, 3653-54 (Fabrikant). Nevertheless, the Board did go on and in effect assume by extrapolation that synergism would occur at the low levels of radiation involved in this case. PID at 69. It concluded that the minute additional quantities of radiation released by Waterford 3 could only result in at most a correspondingly minute additional synergistic effect. Id. The evidence fully supports that conclusion. See, e.g., Hamilton, et al., at 14-15; Tr. 3656-57 (Fabrikant). Even Joint Intervenors' witness agreed that if synergism occurs at low doses in the same manner as at high doses, the synergistic effects would be "proportionately lower according to dose." Tr. 2025 (Johnson).

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state (p. 25) that "Joint Intervenors present the only epidemiological reports available to medical science demonstrating effects of low-level long-term exposures to chemicals and/or radiation (Tr. 1342, Q. 23, 29-42; Tr. 1836, Q. 14, and Dr. Pandit's direct testimony Q. 15)." (emphasis in original). None of the cited testimony presents or discusses epidemiological studies of synergism between chemicals and radiation.

In essence, the Licensing Board made the assumptions and performed the analysis that Joint Intervenors now demand. Accordingly, they can have no substantial basis for complaint.

D. Branagan Testimony

The fourth section of Joint Intervenors' brief (p. 28) addresses two aspects of the testimony of Staff witness Edward Branagan. First, they repeat their argument about the 23 mrem dose that can be derived by adding together the various Appendix I Design Objectives. We have responded to this argument at pages 15-17 supra, and we will not repeat our response here.

Joint Intervenors also complain about corrections that Dr. Branagan made to certain pages of the FES that were attached to his testimony as an exhibit. See Tr. 738-49 (Branagan). Joint Intervenors' concern centers principally on corrections to the source terms that the Staff estimated for Waterford 3. See Tr. 759-61 (Fontana). Dr. Branagan testified that the errors were simply typographical errors and that the Staff's dose calculations were actually based on the correct numbers. Tr. 768-83 (Branagan). Thus the corrections were of no real significance because they had no effect on the Staff's estimated doses from Waterford 3. Moreover, the Board was able to find no prejudice

to Joint Intervenors resulting from the corrections. Tr. 793. There is clearly no basis for reversal here.

E. Evidentiary Rulings

The fifth section of Joint Intervenors' brief (pp. 29-31) attacks three evidentiary rulings by the Licensing Board: (1) the exclusion of Dr. Epstein's testimony; (2) the admission of Dr. Fabrikant's testimony; and (3) the refusal to strike Dr. Branagan's testimony in light of the corrections made by the witness. The last point was covered in the preceding section of this brief, and the discussion will not be repeated here. The other two points are discussed below.

Dr. Epstein was at one time scheduled to be a witness for Joint Intervenors, and he prepared and submitted written direct testimony. However, Joint Intervenors were unable to persuade Dr. Epstein to appear at the hearing and submit to cross-examination. See Tr. 351 (Jones). Counsel for Joint Intervenors recognized the right of Applicant and the Staff to cross-examine Dr. Epstein on his testimony. Tr. 353 (Jones). See 10 C.F.R. § 2.743(a); Carter-Wallace, Inc. v. Gardner, 417 F.2d 1086, 1096 (4th Cir. 1969), cert. denied, 398 U.S. 938 (1970); Duke Power Co. (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 N.R.C. 453, 477 (1982). Joint

Intervenors therefore proposed that Dr. Epstein be cross-examined through written interrogatories or by telephone or that, in the alternative, the testimony be sponsored by Dr. Bross or Dr. Johnson, neither of whom participated in preparing it. Tr. 353-56 (Jones). Applicant and the Staff both objected to the admission of Dr. Epstein's testimony through the procedures suggested by Joint Intervenors. Tr. 356-57 (Turk); Tr. 357-62 (Blake). The Licensing Board excluded the testimony (Tr. 363-65) but allowed it to be filed as a limited appearance statement. Tr. 436-50 (Epstein).

Applicant submits that the Licensing Board's ruling was a sound one that falls well within its power to control the course of proceedings before it and within its discretion over the admission and exclusion of evidence. See 10 C.F.R. § 2.718; Pacific Gas & Electric Co. (Diablo Canyon Nuclear Power Plant Unit 2), ALAB-27, 4 A.E.C. 652, 658-59 (1971) (discretion to exclude statement in the absence of proper sponsoring witness). As the Board pointed out, it needs to hear and see an expert witness in order to judge his credibility. Moreover, long-distance cross-examination makes it difficult or impossible to confront the witness with documents or to ensure that the witness is not referring to unknown documents or being prompted by someone else in the room at his end of the line. The reliability of the testimony is therefore

compromised. Using written interrogatories, of course, robs the cross-examination of all spontaneity and makes follow-up questions impossible. Sponsorship of the testimony by Dr. Bross or Dr. Johnson makes little sense because they did not prepare it and could not respond to probing cross-examination on the substance of the testimony. Indeed, Joint Intervenors' counsel conceded that he was not fully "comfortable" with this proposal and could not "make light of" the objections to sponsorship by someone other than Dr. Epstein. Tr. 355, 356 (Jones).

In short, the Licensing Board clearly did not abuse its discretion in rejecting Joint Intervenors' extraordinary proposals for presenting testimony without the witness being present at the hearing.32/

Joint Intervenors' second point deals with Dr. Fabrikant's qualifications. They argue that he is not an epidemiologist

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32/ In any event, it appears that Dr. Epstein's testimony would have been largely cumulative and could not have affected the outcome of the Licensing Board's decision. Although Dr. Epstein apparently has done some work with synergism between chemicals, he is not experienced in synergism between radiation and chemicals. He makes two references to such synergism but cites no studies to support his beliefs. See Tr. 447, 449 (Epstein). The only support he offers is an undocumented reference to uranium miners and cigarette smoking. Tr. 447 (Epstein). That subject was fully covered during the hearing by Dr. Fabrikant, who pointed out that the uranium miners received enormous doses of radiation ranging from 1,000 rem to 7,000 rem. Tr. 3650-52 (Fabrikant).

and should not have been permitted to criticize Dr. Bross' epidemiological works on the health risks of exposure to low-level radiation. J/I Br. at 30. Dr. Fabrikant's professional qualifications speak for themselves, reflecting his many years of experience investigating and assessing radiation health effects. See Fabrikant at 1-4 and attachment (Curriculum Vitae). He has worked at the very highest levels of science, including service with such prestigious committees as the BEIR Committees, ICRP, the President's Commission on the Accident at Three Mile Island, and several other committees of the federal government. Dr. Fabrikant has taken courses in epidemiology and biostatistics and has taught courses in the Epidemiology Department at Johns Hopkins University. Tr. 3503, 3623-25 (Fabrikant). In addition, he is currently conducting an epidemiological study on 800 patients who have been treated with radiation. Tr. 3293-94 (Fabrikant). He has also included in his own textbook a section on biometry and biostatistics. Tr. 3625 (Fabrikant). Dr. Fabrikant has worked closely with epidemiologists while serving on his scientific committees, including particularly the ICRP and BEIR Committees. Tr. 3502, 3546-47 (Fabrikant).

The Licensing Board was plainly correct in finding Dr. Fabrikant qualified to testify as an expert. Tr. 3629. There is no requirement that a witness have a formal degree in order

to testify as an expert. Under Federal Rule of Evidence 702, a witness may be qualified as an expert by reason of his "knowledge, skill, experience, training, or education . . . ."33/ Dr. Fabrikant's experience, training and knowledge amply demonstrate that he is qualified to give the expert testimony at issue here. See 3 J. Weinstein & M. Berger, Weinstein's Evidence ¶ 702[04] (1982). Surely there is no abuse of discretion by the Licensing Board here.

F. Limited Appearance Statements

The last section of Joint Intervenors' brief on synergism (p. 31) argues that the Licensing Board failed to address limited appearance statements expressing concern about the incompetence or bias of the Licensing Board, the NRC, and state and local officials. The effect of limited appearance statements was discussed in Iowa Electric Light & Power Co. (Duane Arnold Energy Center), ALAB-108, 6 A.E.C. 195 (1973):

33/ The Appeal Board has held that Federal Rule 702 provides a suitable test for expert witness qualifications and that it is a matter for the Licensing Board's discretion to determine whether a witness is qualified. Duke Power Co. (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 N.R.C. 453, 475 (1982); Wisconsin Electric Power Co. (Point Beach Nuclear Plant, Unit 2), ALAB-78, 5 A.E.C. 319, 335 (1972) (evaluation of expert's qualifications within licensing board's discretion).

> Our approval of the result reached by the Licensing Board should not be taken as signifying agreement with that Board's comment (Memorandum and Order, p. 8) to the effect that, if Mr. Laitner chooses to make a limited appearance at the hearing, the Board "will be obligated to take [his] position into account" in issuing its final ruling. A limited appearance statement is not evidence. Its impact upon the decision-making process is much less direct -- it serves to alert the Board and the parties to areas in which evidence may need to be adduced. It can be taken into account only to that extent.

Id. at 196 n.4. Thus the limited appearance statements upon which Joint Intervenors rely are not evidence and could not properly have influenced the Licensing Board in reaching its decision. Such statements only serve to identify areas in which further evidence may be needed. In this case, the Board can hardly be faulted for concluding that the charges of bias and incompetence in the limited appearance statements were not "areas in which evidence may need to be adduced." Id.34/

34/ See 10 C.F.R. Part 2, Appendix A(V)(b)(4) (questions raised by limited appearance statements to be considered only if "relevant and meritorious" and "within the scope of the proceeding").

III. CONTENTION 17/26 (EMERGENCY PLANNING)

Joint Intervenors' brief on their exceptions relating to emergency planning issues is contained in their February 4, 1983 filing entitled, "Explanation of Exceptions on Evacuation Contentions 17/26(1) and (2)." Joint Intervenors had filed 30 exceptions (Exceptions 8-37) related to the emergency planning contentions, and have referenced only 14 of them in their brief (Exceptions 8-14, 20 27-32). Joint Intervenors did not brief the remaining emergency planning exceptions, nor did they brief Exceptions 29 and 30 which were referenced in the title of Category (5) in their brief at page 9. Thus, this portion of Applicant's brief will address the 12 remaining exceptions which have been addressed by Joint Intervenors (Exceptions 8-14, 20, 27, 28, 31 and 32).

Joint Intervenors' issues relating to emergency planning were encompassed within Contentions 17/26(1)(a)-(f) and 17/26(2), which read as follows:

Contention 17/26(1)

> Applicant has failed to adequately make provision, according to the Emergency Plan contained in Chapter 13.3 of the FSAR, for evacuation of individuals located within the 10-mile plume exposure pathway emergency planning zone for the Waterford 3 site in the event of a serious reactor incident, as required by applicable NRC regulations, in that:

(a) the provisions for notifying residents of evacuation procedures are inadequate;

(b) the roads and highways necessary for such evacuation are inadequate;

(c) the evacuation warning system is inadequate;

(d) there is not an adequate command decision structure, including appropriate guidance, for commencing evacuation;

(e) the Emergency Plan fails to provide for realistic and comprehensive evacuation drills, in that the provisions for moving individuals are not actually tested; and

(f) procedures are inadequate for evacuating people who are:

(i) without vehicles;
(ii) school children;
(iii) aged or crippled;
(iv) sick and hospitalized;
(v) imprisoned;
(vi) transient workers.

Contention 17/26(2):

Applicant has failed to adequately make provision, according to the Emergency Plan contained in Chapter 13.3 of the FSAR, for distribution and/or storage of potassium iodide in accordance with accepted public health practice in locations which are readily accessible to affected individuals as protection against thyroid irradiation.

Contention 17/26(1)(a) will be addressed by the Licensing Board in its decision on the reopened hearing session concerning the adequacy of the public information brochure. Also, Joint Intervenors have briefed no exceptions relating to Contention 17/26(1)(e) or Contention 17/26(2). Thus, the emergency planning issues currently before the Appeal Board must fall within the ambit of Contentions 17/26(1)(b), (c), (d) and (f).

The emergency planning contentions are limited in scope. The contentions go only to the adequacy of provisions in the emergency plans for evacuation of the public within the ten-mile plume exposure pathway Emergency Planning Zone ("plume EPZ"); they do not contest the adequacy of provisions for other planned protective actions, such as sheltering or respiratory protection, or of other provisions in the plans unrelated to evacuation. Moreover, the contentions challenged only specific aspects of the evacuation plans. And finally, because the contentions deal with evacuation plans, they involve primarily the offsite emergency plans of the State of Louisiana and the St. Charles and St. John the Baptist Parishes. The Applicant's onsite emergency plan is involved only peripherally, if at all.

At the hearing, Applicant presented the direct testimony of seven witnesses on Contention 17/26(1), including representatives of Applicant, the State of Louisiana, and St. Charles and St. John the Baptist Parishes.35/ Representatives of the

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35/ Applicant's witnesses on Contention 17/26(1) were Robert G. Azzarello, a nuclear engineer employed by Applicant

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NRC Staff and of the Federal Emergency Management Agency ("FEMA") also testified.36/ Joint Intervenors presented no witnesses. Thus, a number of the specific issues on appeal here were raised by Joint Intervenors for the first time during cross-examination, and subsequently addressed during redirect examination.

Joint Intervenors have grouped their briefed exceptions into eight categories, which we address in turn below in Sections B through I, following a general discussion in Section A below on evidentiary rulings.

(Continued)

with emergency planning responsibilities; Alexis Tsaggaris and Ronald J. Perry, emergency planning specialists employed by Energy Consultants, Inc., which was engaged by Applicant to assist in emergency planning; Kevin P. Twine, an employee of Ebasco Services, Inc. which was engaged by Applicant to perform the evacuation time estimate; Robert W. Myers of the Nuclear Energy Division ("LNED") of the Office of Environmental Affairs, Louisiana Department of Natural Resources; John M. Lucas, Director, Department of Emergency Preparedness, St. Charles Parish; and Bertram P. Madere, Civil Defense Director, St. John the Baptist Parish.

36/ The NRC Staff witnesses were Donald J. Perrotti, an Emergency Preparedness Analyst; Brian K. Grimes, then Director of NRC's Division of Emergency Preparedness; and Thomas Urbanik II, a transportation engineering consultant to the Staff. FEMA Emergency Management Officer Albert L. Lookabaugh and FEMA Emergency Management Specialist John W. Benton also testified.

A. Evidentiary Rulings

A number of Joint Intervenors' exceptions relate to Licensing Board rulings sustaining objections to questions posed by Joint Intervenors on cross-examination, (i.e., Exceptions 11, 12, 14, 20, 27, 31 and 32). There are several established principles which must be considered in determining whether a licensing board has committed error in excluding questions on cross-examination. We will here briefly discuss those principles, and apply them to Joint Intervenors' specific exceptions in our discussions of the individual exceptions in Sections B through I below.

1. In general, a party does not have such a "fundamental right" of cross-examination that any denial constitutes prejudicial error per se. Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), CLI-82-11, 15 N.R.C. 1383, 1384 (1982). No party has a right to unfettered or unlimited cross-examination, Northern States Power Co. (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-244, 8 A.E.C. 857, 869 at n.16 (1974), and the scope of cross-examination is a matter of licensing board discretion. Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-461, 7 N.R.C. 313, 316 (1978).

2. The Appeal Board has clearly held that cross-examination must be within the scope of the admitted

contentions, and must be strictly limited to the scope of the direct examination of the witness. Prairie Island, ALAB-244, at 867; Northern States Power Co. (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-252, 8 A.E.C. 1175, 1179, aff'd, CLI-75-1, 1 N.R.C. 1 (1975). The Appeal Board noted that the purpose of the requirement for the early definition of contentions, which is particularly important in an operating license hearing, is "to enable the parties and the Board to ascertain at the very outset of the proceeding which issues are in contest." Prairie Island, ALAB-244, at 867. The Appeal Board went on to state that the Licensing Board has full authority to insure that cross-examination is strictly limited to the scope of direct examination and to insure, therefore, that "cross-examination is not employed by any party to expand the number or boundaries of the contested issues." Id. at 867. This was specifically reinforced by the Commmission in affirming ALAB-252:

> As stated by the Appeal Board, such inquiry shall be "strictly confined to the scope of the direct examination in order to insure that it does not have the effect of expanding the boundaries of the contested issues."

Prairie Island, CLI-75-1 at 2 (footnote omitted).

In each and every instance which Joint Intervenors allege in their exceptions to be improper curtailment of

cross-examination, the proffered questions, as we will discuss more fully in subsequent sections of this brief, were outside the scope of the admitted contentions, and outside the scope of the witness' prior testimony.

3. To merit consideration on appeal, there must be a showing that the exclusion of evidence constitutes a serious error affecting a substantial right and improperly affecting the outcome of the hearing. The Appeal Board recognizes this principle:

> Some procedural and evidentiary errors almost invariably occur in lengthy hearings where the presiding officer must rule quickly and without the opportunity for collegial consultation that makes appellate tribunals appear omniscient. Only serious errors affecting substantial rights and which might have influenced improperly the outcome of the hearing merit exception and briefing on appeal.

Northern Indiana Public Service Co. (Bailly Generating Station, Nuclear-1), ALAB-204, 7 A.E.C. 835, 836 (1974). And more recently:

> The rule in the federal courts, to which we can look for guidance, is that error may not be predicated upon a ruling which excludes evidence unless a substantial right is affected, and the substance of the evidence is made known by way of an offer of proof or is otherwise apparent.

Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-673, 15 N.R.C. 688, 697 at n.14, aff'd, CLI-82-11, 15 N.R.C. 1383 (1982); see also Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-717, slip opinion at 10-11 (March 4, 1983). In affirming ALAB-673, the Commission stated its agreement with the Appeal Board "that Intervenors have not sufficiently demonstrated that they were substantially prejudiced by not being allowed to cross-examine witnesses" on a particular subject. CLI-82-11, at 1384-85 (emphasis supplied).

B. Category (1) - Classification of Issues in the Partial Initial Decision (Exception 8)

In Exception 8, Joint Intervenors assert that the Licensing Board erred in treating four alleged planning "omissions" in its Partial Initial Decision under Contention 17/26(1)(b) rather than under Contention 17/26(1)(f). Joint Intervenors are presumably referring to four issues which they discussed in their proposed findings of fact and conclusions of law at pages 9-13 and 20-21.37/ In that document, Joint

37/ That document, untitled, was filed by Joint Intervenors on June 9, 1982. The pages of the document are unnumbered, and page references herein are to Applicant's numbering of the pages.

Intervenors characterized the four issues -- dealing with refusal to evacuate, vehicular accidents during evacuation, anxiety,38/ and the planned evacuation routes -- as "omissions" that were "overlooked in the preparation of evacuation plans."

In Exception 8, Joint Intervenors make no specific allegations of substantive error by the Licensing Board in its treatment of the four issues. Joint Intervenors allege only that the Licensing Board considered the issues in the wrong part of the PID. Since the Licensing Board did indeed discuss and dispose of the four issues at pages 13-16 of the PID, Exception 8 cannot be construed as error, and should therefore be denied.39/

In treating the four issues under Contention 17/26(1)(b), the Licensing Board noted that the issues were not precisely covered by the contention, but were relevant to it. PID at 13. Indeed, the issues were not previously covered by any of Joint

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38/ Joint Intervenors use the term "hysteria," although emergency planning experts generally discuss the subject in terms of "anxiety." The Licensing Board uses the term "anxiety," as will we in this brief. See PID at 14 n.14.

39/ Other exceptions which relate to the subject matter of some of the "omissions" have been addressed elsewhere in Joint Intervenors' brief, i.e., Category (2) deals with the refusal to evacuate, Category (7) deals with anxiety, and Category (8) deals with the planned evacuation routes. These issues will be addressed later in this brief in our discussions of those categories.

Intervenors' contentions. None of the four issues was identified by the wording of any of Joint Intervenors' contentions, and none had been identified by Joint Intervenors in response to interrogatories by Applicant and the NRC Staff designed to elicit the precise allegations of Joint Intervenors encompassed by their contentions. The issues were raised for the first time by Joint Intervenors during cross-examination at the hearing, and they were not then identified as relating to any specific contention.

In the interests of developing an orderly contention-by-contention decision, the Licensing Board was obviously attempting to place the four issues in their most logical context, and that, Applicant submits, could be none other than Contention 17/26(1)(b). Certainly it would not be, as Joint Intervenors contend, Contention 17/26(1)(f), and Joint Intervenors have offered no explanation of why the four issues would be uniquely related to the evacuation of special populations, as compared to the population at large.

In any event, Joint Intervenors can hardly be prejudiced by the Licensing Board's having considered the four issues in terms of the entire population to be evacuated, rather than limiting consideration to the special populations identified in Contention 17/26(1)(f). Joint Intervenors complain that the Licensing Board addressed their "strongest arguments" in the

"weakest category", presumably suggesting (without explanation) that the Licensing Board somehow evaluated the issues against lesser standards under Contention 17/26(1)(b) than would have been used under Contention 17/26(1)(f). If anything, the opposite would be true, for the Licensing Board treated each of the issues in the rigorous context of whether Applicant's evacuation time estimates had been reasonably determined, as well as in the context of evaluating the overall evacuation planning. The Licensing Board concluded that "Applicant's evacuation time study demonstrates a reasonable evacuation time estimate, and [rejected] Joint Intervenors' allegations of four deficiencies in this estimate and in the evacuation scheme." PID at 16 (emphasis supplied). Joint Intervenors took no exception to this conclusion.

C. Category (2) - Refusal to Evacuate (Exceptions 9, 10, 11 and 32)

The exceptions in this category relate to the question of whether members of the public would refuse to evacuate. In Exception 9, Joint Intervenors allege that the Licensing Board erred in relying on the "unsupported opinion" of John M. Lucas, the Director of the Department of Emergency Preparedness of St. Charles Parish, in finding that few people would refuse to evacuate. See PID at 13, 39 (FF 15). The record, however,

discloses that the Licensing Board's finding was correct and justified by the testimony of Mr. Lucas and of Bertram P. Madere, Civil Defense Director of St. John the Baptist Parish.

The issue of refusal to evacuate was not raised by any of Joint Intervenors' contentions (nor was it identified in discovery), and was raised for the first time by Joint Intervenors during cross-examination of Mr. Lucas. (Tr. 2714-25).40/ It was subsequently addressed in redirect testimony by Mr. Lucas and Mr. Madere. (Tr. 3034-39). Both witnesses, who have undeniable expertise and extensive experience in the direction of large numbers of evacuations in their respective parishes,41/ testified without contradiction that they would not expect significant numbers of people to refuse to evacuate in the event of an accident at Waterford 3. Tr. 3034 (Madere); Tr. 2723-24, 3036-37 (Lucas).

This opinion was corroborated generally by NRC Staff witness Brian K. Grimes, then Director of NRC's Division of Emergency Preparedness. Mr. Grimes, in his capacity as NRC's Co-Chairman of the joint NRC/FEMA Steering Committee for

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40/ Applicant's objection to the line of questioning on the grounds that it was outside the scope of Joint Intervenors' contentions was not sustained by the Licensing Board. (Tr. 2721-23).

41/ See Madere prepared testimony, following Tr. 2243, at 1-4; Lucas prepared testimony, following Tr. 2246, at 1-3.

Emergency Preparedness, and also in his capacity as NRC's Co-Chairman of a joint NRC/Environmental Protection Agency Task Force on Emergency Planning, was instrumental in the development of the emergency preparedness criteria in NUREG-0654, as well as the development of the planning basis underlying these criteria, set out in NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants" (1978). See Grimes prepared testimony at 1 and Statement of Professional Qualifications, following Tr. 3779; Tr. 3756. See also NUREG-0654 at i, 5-6. Mr. Grimes testified that experts in the field of emergency preparedness are confident that the public will generally comply with the instructions of officials implementing emergency plans in the event of a nuclear accident. Tr. 3800.

The record indicates a single isolated instance of refusal to evacuate. This was an extremely localized and unique situation, involving tank cars, which continued over a period of a week. On the first day, nine households were advised to evacuate, and all complied voluntarily. They were later permitted to return to their homes, and on the second day they were again advised to evacuate. This time, three households declined, maintaining that they had evacuated earlier and nothing had happened. Tr. 2717-19, 3035-36 (Lucas). That

isolated occurrence, with the unique circumstances surrounding it, obviously did not alter the expert opinion of the two highly experienced local emergency preparedness directors that significant instances of refusal to evacuate would not occur in the event of an accident at Waterford 3. The Licensing Board was correct in so finding, and could not have been expected to find otherwise on the basis of the record before it.42/

In Exception 10, Joint Intervenors assert that the Licensing Board erred in finding that there would be no diversion of Parish resources for dealing with people who refuse to evacuate. That finding by the Licensing Board is consistent with the showing that few people are likely to refuse to evacuate, and is based on the uncontradicted testimony of both Mr. Lucas and Mr. Madere that the Parishes would not divert resources needed to carry out the evacuation in order to forcibly evacuate those who might refuse to leave. Tr. 3037-38 (Madere); Tr. 3039 (Lucas). The Licensing Board was precisely correct in its finding, and Joint Intervenors offer no explanation of how the record could possibly support a conclusion to the contrary.

42/ Joint Intervenors, at page 4 of their brief, allege that "millions of dollars" have been spent on media messages "downplaying the hazards of radiation," and assume that this will result in "one-third or more of the population refusing to evacuate." This is pure rhetoric, as the record is totally devoid of support for such speculation.

Although not put forth in their contentions and not raised in their exceptions, Joint Intervenors present in their brief a concern that perhaps the emergency plans should provide for a diversion of resources away from the evacuating general public to forcibly evacuate those few who might not want to leave. Nowhere in the regulations or in NUREG-0654 does there appear such a requirement, or even such a suggestion. Moreover, the testimony of Messrs. Lucas, Madere and Grimes discussed above indicates that there is no need for such a requirement, since refusal to evacuate is not expected to be a significant problem. In any event, contrary to the unstated assumption in Joint Intervenors' argument, persons refusing to evacuate voluntarily would not be abandoned. Both Parish Directors testified that those persons would be evacuated by officials as resources become available. Tr. 3038 (Madere); Tr. 3038-39 (Lucas).

The remaining two exceptions in this category (Exceptions 11 and 32) relate to the extent of the diversion of resources that would be necessary to achieve evacuation of those who might refuse to leave.43/ Joint Intervenors' complaint in

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43/ The thrust of Exception 32 is not clear, since Joint Intervenors, contrary to the requirements of 10 C.F.R. § 2.762(a), did not identify the portion of the decision to which the exception is addressed.

Exception 11 is that the Licensing Board sustained an objection by Applicant to a question addressed to Mr. Lucas about the extent of the parishes' resources that would be used during an evacuation for "picking up people who refuse to evacuate." Tr. 2724. The Licensing Board correctly held that the question was "beyond reasonable bounds," for, indeed, the question was well outside the scope of any of the issues raised by Joint Intervenors' contentions. Id. Diversion of resources to evacuate people who might refuse to leave bears no relationship to notifying residents of evacuation procedures, the adequacy of roads and highways, the evacuation warning system, the command decision structure, or exercises. Contentions 17/26(1)(a)-(e). Certainly Joint Intervenors did not specify this classification of persons in Contention 17/26(1)(f). In any event, testimony on the extent of resources to be diverted would contribute little, if anything, to resolution of the issues before the Licensing Board in light of the uncontradicted testimony on the record that few people would be likely to refuse to evacuate and that parish resources would not be diverted to evacuate such people, and would not be used until the resources became available for such purpose.

Joint Intervenors also argue in their brief that the Licensing Board allowed Applicant to ask questions "pertaining to resource commitment," and that Joint Intervenors had no

opportunity to "redirect questions at Lucas." Neither allegation was put forth by Joint Intervenors in an exception. Moreover, the record does not support Joint Intervenors' characterization of the record. Applicant's questions on redirect did not go to the nature or extent of resources that would be necessary for such activities; they were posed for the limited purpose of showing that parish resources would not be diverted for involuntary evacuation. Tr. 3037-39. Thus, Applicant's questions on redirect did not address the subject matter of Joint Intervenors' disallowed questioning and did not provide an opening for Joint Intervenors to explore the subject matter on recross-examination.

In any event, Joint Intervenors did not object to Applicant's redirect on the diversion of resources for involuntary evacuation. See Tr. 3037-39. Nor did Joint Intervenors seek leave to recross on the redirect of Applicant's witnesses on this issue. Accordingly, Joint Intervenors have waived the arguments they now seek to press. See generally, e.g., Consumers Power Co. (Midland Plant, Units 1 and 2), ALAB-123, 6 A.E.C. 331, 333 (1973) (characterizing as "intolerable" the situation where a party remains mute, then later raises procedural objections which could have been cured if raised earlier); Purer & Co. v. Aktiebolaget Addo, 410 F.2d 871, 876 (9th Cir.), cert. denied, 396 U.S. 834 (1969) (holding that

failure to raise objection to testimony at trial waives the objection). And, as we noted above, there would be little point in pursuing questions on the extent of resources to be diverted when the record shows that none will be diverted.

Accordingly, for all of the foregoing reasons, Joint Intervenors' Exceptions 9, 10, 11 and 32 are without merit and should be denied.

D. Category (3) - Failure to Allow Cross-Examination Concerning Witnesses' Knowledge of Accident Consequences (Exceptions 12 and 31)

In Exceptions 12 and 31, Joint Intervenors assert that the Licensing Board erred in not allowing them to question Applicant's witnesses on their knowledge of the consequences of severe accidents at Waterford 3 and their familiarity with the radioactive materials potentially released from nuclear power plants.44/

44/ From Joint Intervenors' citations to the transcript at page 6 of their brief, the questions Joint Intervenors assert should have been answered are as follows:

"Do you know the consequences of the worst possible accident at the Waterford Nuclear Power Plant, which would be a fuel core meltdown?" (to each of the seven witnesses on Applicant's panel, identified in n.35, supra, Tr. 2279; similar question to Mr. Madere, Tr. 2236, to Mr. Lucas, Tr. 2710, to Mr. Myers, Tr. 2253, and to Mr. Azzarello, Tr. 2269-77).

"Will you tell me the predicted consequences of the maximum credible accident according to the reactor safety study

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After hearing argument from counsel for Applicant, the NRC Staff, and Joint Intervenors, the Licensing Board sustained the objections to that line of questioning on three separate grounds. Tr. 2276-77; See generally Tr. 2269-77. The Licensing Board ruled, first, that the questions were beyond the scope of Joint Intervenors' contentions, and, second, that the questions did not go to matters covered in the witnesses' direct testimony, and were therefore not appropriate for cross-examination. The Licensing Board also noted that the NRC and FEMA took into account the most severe types of nuclear

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called the WASH-1400 study, dated 1975"? (to Applicant's panel, Tr. 2279; similar question to Mr. Myers, Tr. 2253).

"Do you know the predicted consequences of the maximum credible accident of the Brookhaven Report called WASH-740 Report dated 1957?" (to Applicant's panel, Tr. 2280).

"In regard to these three reports and studies that I just mentioned, are you aware of the predicted consequences of immediate deaths, injuries, thyroid cancers, genetic effects, latent cancer deaths, property damage, square miles contaminated, square miles evacuated and ground water contaminated according to these three reports?" (to Applicant's panel, Tr. 2280).

"Are you familiar with plutonium 239 which would be produced from the Waterford Nuclear Power Plant?" (to Applicant's panel, Tr. 2282).

"Are you familiar with cesium 137?" (to Mr. Madere, Tr. 2237).

"Zinc 65?" (to Mr. Madere, Tr. 2237-38).

accidents when they formulated the emergency planning criteria set out in NUREG-0654.45/

Although any one of the three grounds alone would provide sufficient basis to support the Licensing Board's rulings excluding the questions, the Licensing Board was clearly correct on all three counts. The Licensing Board is governed by the provisions of 10 C.F.R. § 2.760a, which limit consideration to matters which have been put into controversy in the proceeding (and any raised sua sponte by the Licensing Board). Each of Joint Intervenors' contentions dealt solely with the adequacy of the State and Parish emergency plans. None of the contentions in any way touches on the knowledge or educational qualifications of any particular individuals, or of individuals generally, involved in the planning or implementation of evacuations. Accordingly, the direct testimony of Applicant's witnesses did not address the subject matter of the questions, and they were clearly outside the bounds of acceptable cross-examination.

The Licensing Board's third ground was responsive to the argument made by Applicant, Tr. 2271-72, and the NRC Staff, Tr. 2275-76. The criteria in NUREG-0654 encompass and anticipate

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45/ Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654/FEMA-REP-1, Rev. 1, November 1980.

the full spectrum of accidents, ranging from minor to the most severe. Thus, if the emergency plans satisfy the criteria in NUREG-0654, they will adequately provide evacuation procedures for the most severe accident. The plans are designed to work for any type of accident. There are no FEMA or NRC requirements in the regulations or in NUREG-0654 pertaining to the educational levels of the persons responsible for carrying out an evacuation, and no requirements that they possess a detailed technical understanding of nuclear accidents. See, e.g., Tr. 2883 (Lookabaugh); Tr. 2908 (Benton); Tr. 2943, 2952 (Myers); Tr. 2957-58 (Madere); Tr. 3760-61, 3847 (Grimes); Tr. 3886-87 (Perrotti).

Although the three grounds cited by the Licensing Board were argued at the hearing, Joint Intervenors chose not to respond to them. Tr. 2272-73. Nor did Joint Intervenors address those grounds in their proposed findings and conclusions or in their appeal brief. Instead, Joint Intervenors in their post-hearing filings have attempted to argue the issue, without first addressing the Licensing Board's ruling which found the issue to be beyond the scope of the proceeding.

Joint Intervenors have never made clear why these questions should have been posed indiscriminately to all of Applicant's witnesses or how such questions would in any way have contributed to the resolution of the issues before the

Licensing Board concerning the adequacy of the emergency plans. The command decision structure certainly does require the participation of individuals who have the expertise to technically evaluate an accident and its potential consequences. These individuals include the Applicant's onsite Emergency Coordinator and his staff, and the technical staff at the Louisiana Nuclear Energy Division ("LNED"). The Parish Chief Executives, who are elected officials, make the decisions to implement protective actions based on the recommendations received from the Applicant's Emergency Coordinator and LNED. See generally PID at 18-20, 46-50 (FF 41-52). LNED has extensive technical expertise to enable it to evaluate the detailed technical information which would be provided to it by Applicant in the event of an accident, and to independently recommend protective actions to the Parishes. Tr. 3079-84. The officials who actually implement the plans at the Parish level should have a general appreciation that a radiological accident could involve a substantial hazard requiring their timely response and the response of the public. However, the officials need not have detailed knowledge of specific scenarios and radioactive releases. Tr. 3846-47 (Grimes). As it happens, during the course of the hearing while testifying about the various aspects of the emergency plans, Messrs. Lucas and Madere convincingly demonstrated their knowledge of the

existence and nature of the hazard posed by nuclear accidents and the need for timely and effective response. Joint Intervenors have not alleged to the contrary. Thus, in view of the foregoing, and considering that Joint Intervenors had not advanced contentions on the issue, there clearly is no prejudice to or abridgment of Joint Intervenors' rights in this proceeding.

The Licensing Board did not err in excluding Joint Intervenors' questions, and Exceptions 12 and 31 should be denied.

E. Category (4) - Predictive Findings and Post-Hearing Verification (Exception 13)

Joint Intervenors maintain in Exception 13 that the Licensing Board erred in "using the concept of post-hearing verification and predictive findings." This exception should be summarily dismissed at the outset, since Joint Intervenors have failed to identify the specific Licensing Board findings with which they take issue. Joint Intervenors stated the general subject matter of their concern, but contrary to the requirements of 10 C.F.R. § 2.762(a), Joint Intervenors' Exception 13 did not "state concisely . . . the single error of fact or law which is being asserted" and their brief did not "specify . . . the precise portion of the record relied upon in

support of the assertion of error." In short, Joint Intervenors simply did not identify any specific finding or ruling of the Licensing Board which they claim is in error, and provided no citations to the record whatsoever.

This is no mere technicality. In the absence of such information, Applicant does not know which specific rulings to address; does not know what instances, if any, in which there are alleged to be inadequate bases for findings of reasonable assurance; and does not know whether, or to what extent, the NRC Staff or FEMA is alleged to have inappropriate latitude in making its post-hearing verifications. Applicant is confident that there are no instances of Licensing Board findings inadequately supported by the record, and that all "predictive" findings and post-hearing verifications are consistent with Commission policy and precedent, not to mention practicality and good common sense.

Notwithstanding Joint Intervenors' failure to comply with specific appellate requirements, we feel compelled to comment on Joint Intervenors' clearly erroneous statement of applicable law. The assertion that a licensing board is not permitted to make "predictive findings" or rely on "post-hearing verification" is contrary to the fundamental principles upon which NRC construction permit and operating license proceedings have traditionally been conducted and, more specifically, contrary

to recent Commission policy on the nature of the findings on emergency preparedness required for licensing.

The NRC's regulatory framework provides for health and safety findings to be made by the NRC Staff, and for hearings on construction permits and operating licenses to be held, prior to the issuance of the permit or license. The findings to be made, whether by the NRC Staff or a licensing board, must necessarily involve an element of predictiveness. This is particularly true for the Commission regulations relating specifically to emergency preparedness:

> [N]o operating license for a nuclear power reactor will be issued unless a finding is made by NRC that there is reasonableness assurance that adequate protective measures can and will be taken in the event of a radiological emergency.

10 C.F.R. § 50.47(a)(1) (emphasis supplied). The Commission, in conjunction with a recent amendment to 10 C.F.R. § 50.47 which specified that the conduct of emergency preparedness exercises are not required for any initial licensing decision, discussed at some length the subject of predictive findings as they relate to emergency preparedness requirements in general. See generally 46 Fed. Reg. 61134-36 (December 15, 1981) and 47 Fed. Reg. 30232-36 (July 13, 1982). The Commission explicitly stated in its notice of proposed rulemaking that:

> The findings on emergency planning required prior to the issuance of a

> license would, insofar as satisfactory implementation of emergency response plans or actual state of preparedness are concerned, be essentially predictive in nature.

46 Fed. Red. 61134 (emphasis supplied). Accordingly, the Commission amended its regulations, not only to specifically clarify that licensing decisions need not include the results of an exercise, but also to clarify that the pre-licensing findings on emergency planning in general are "predictive in nature and need not reflect the actual state of preparedness at the time the finding is made," and to "emphasize the predictive nature of the review." 47 Fed. Reg. 30232.

Joint Intervenors have not distinguished the instant case from the multiplicity of other licensing proceedings in which predictive findings and the post-hearing verification process have been employed. As the Licensing Board in Cincinnati Gas & Electric Co. (Wm. H. Zimmer Nuclear Power Station, Unit 1), LBP-82-48, 15 N.R.C. 1549 (1982) correctly observed:

> The record indicates that the prompt notification system will comply with the applicable regulatory requirements. We do not agree with [Intervenor] that it is significant that testing of the system is to occur after the close of this record. In nuclear licensing cases, it frequently happens that the adequacy of certain systems is litigated in advance of operational testing; this particular system has not been shown to warrant different treatment.

Id. at 1576. In fact, each of the emergency planning decisions issued under the Commission's revised emergency planning regulations is replete with predictive findings and requirements for post-hearing Staff confirmation and verification of various matters litigated in the hearing.46/ Accordingly, Joint Intervenors' broad-brush objections to the use of predictive findings and the post-hearing verification process in this proceeding are without merit and must be rejected.

Joint Intervenors allege that Appeal Board and Licensing Board decisions have held that licensing boards may not delegate contested matters to the Staff for post-hearing resolution. We take no issue with this principle, but we do

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46/ In addition to the Zimmer decision quoted above, see, e.g., Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), LBP-81-59, 14 N.R.C. 1211 (1981), aff'd in part, ALAB-697, 698 (Oct. 22, 1982), ¶ 1537, at 1525-26 (finding that public information program as proposed and in place meets current requirements, and requiring distribution of brochures prior to restart of TMI-1), and ¶ 1564, at 1536 (finding that proposed siren system will provide early warning to public; installation and verification testing of system, and review of same by Staff, required prior to restart of TMI-1); Pennsylvania Power and Light Co. (Susquehanna Steam Electric Station, Units 1 and 2), LBP-82-30, 15 N.R.C. 771, 795 (1982), aff'd, ALAB-702 (Nov. 22, 1982) (finding that since all parties concur that public information brochure should be distributed prior to operation, Board can reliably assume it will occur); Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), LBP-82-39, 15 N.R.C. 1163 (1982), ¶ G.10, at 1266 (finding that siren system not tested at time of hearing, requiring Staff verification of system performance). See also id. at 1252-53 (discussing generally the concepts of predictive findings and post-hearing verification).

not see how it obtains in the instant case. Predictive findings, with the added assurances to be derived from post-hearing verification by FEMA and the NRC Staff, by their very nature constitute resolution of the issues. The issues here are for the Licensing Board to find that there is reasonable assurance that adequate protective measures can and will be taken in the future. Joint Intervenors have provided no discussion or explanation of why any of the Licensing Board's findings of reasonable assurance would be in error; indeed, they have not even identified which of the findings they would so dispute.47/

Accordingly, Joint Intervenors' Exception 13 is without merit and must be denied.

47/ Ironically, one of the Appeal Board cases cited by Joint Intervenors emphasizes the fatal nature of Joint Intervenors' failure to identify the disputed findings and provide citations to the record. The Appeal Board noted that briefs are necessary not only to give the Appeal Board "sufficient information to evaluate the basis of objections to the decision below, but also to provide an opponent with a fair opportunity to come to grips with the appellant's arguments and attempt to rebut them." The Appeal Board went on to say that "[t]he absence of a brief not only makes our task difficult but, by not disclosing the authorities and evidence on which the appellant's case rests, it virtually precludes an intelligent response by appellees." Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-461, 7 N.R.C. 313, 315 (1978). See also Pennsylvania Power & Light Co. (Susquehanna Steam Electric Station, Units 1 and 2), ALAB-693, slip opinion at 4-5 (September 28, 1982).

F. Category (5) - Failure to Allow Cross-Examination on the Present Command Structure (Exception 14) 48/

In Exception 14, Joint Intervenors assert that the Licensing Board erred "in not allowing cross-examination concerning the present command structure and its possible conflicts of interest." In fact, Joint Intervenors were not precluded from conducting cross-examination on the decision-making structure embodied in the emergency plans. Joint Intervenors' exception, as gleaned from their citations to the record, goes to the much narrower question of whether they should have been allowed to ask questions concerning alleged (and baseless) conflicts of interest of the present president of St. Charles Parish Council.49/ This issue was not raised by Joint Intervenors prior to the hearing, and there is nothing in discovery responses or any other filings or record evidence in this proceeding to suggest conflicts of interest. The Licensing Board sustained objections to such questions on the grounds that they were beyond the scope of Joint Intervenors'

48/ Joint Intervenors also made reference to Exceptions 29 and 30 in the title of Category (5) at page 9 of their brief, but the brief addressed neither those exceptions nor anything resembling the subject matter of those exceptions.

49/ Joint Intervenors' brief suggests that they were prevented from asking similar questions concerning Mr. Madere. However, these questions, which were posed in voir dire, were all allowed. Tr. 2234-35.

Contention 17/26(1)(d). See generally Tr. 2961-66. Joint Intervenors omitted entirely from their brief any discussion of the direct issue presented by the Licensing Board's ruling -- whether the questions were within the scope of the admitted contentions.

Contention 17/26(1)(d) alleged that the emergency plan was deficient in that the "command decision structure" for commencing evacuation was inadequate. In response to that contention, Applicant's witnesses testified to the decision-making structure embodied in the plans. Neither the contention nor the witnesses' direct testimony addressed the specific individuals who now occupy, or will occupy in the future, the various positions described in the emergency plan. Thus, the Licensing Board clearly did not err in sustaining objections to such questions which were clearly beyond the scope of the admitted contentions and the witness' direct testimony. Moreover, since this was not an issue raised by Joint Intervenors in their contentions, they certainly cannot make a showing of prejudice or curtailment of rights.

Joint Intervenors' Exception 14 must therefore be denied.

G. Category (6) - Failure to Allow Cross-Examination on the Adequacy of the Telephone System (Exception 20)

Joint Intervenors assert, in Exception 20, that the

Licensing Board erred in not allowing the Joint Intervenors to question state officials on the adequacy of the telephone system during an emergency. Once again, it is a case of a question being asked outside the scope of the admitted contentions in the proceeding, and not related to the witness' direct testimony, and once again, Joint Intervenors simply do not address in their brief the grounds upon which the objection was sustained.

Joint Intervenors asked Mr. Myers whether LNED had conducted any studies of the extent of telephone use that would occur in the event of a nuclear accident. Tr. 2819. In response to an objection by Applicant on the grounds that the question was beyond the scope of the Joint Intervenors' admitted contentions and not relevant to the witness' testimony, Joint Intervenors argued that it related to Contention 17/26(1)(a) (notifying residents of evacuation procedures) and Contention 17/26(1)(d) (adequacy of command decision structure). With respect to the latter contention, Joint Intervenors stated they were trying to determine if there would be "a breakdown of command decisions and structures and guidance and -- commencing evaluation [sic: evacuation?], because of the extreme use [of the telephone] that would occur." Tr. 2819. Joint Intervenors offered no argument with respect to Contention 17/26(1)(a). Applicant pointed out that

the communications involved under both contentions had been set forth on the record, and neither involved the use of the commercial telephone system. Tr. 2820. Moreover, in response to Joint Intervenors' next question -- which was allowed by the Licensing Board without objection -- Mr. Myers testified that excessive use of commercial telephones would not affect necessary emergency communications. Tr. 2820.

Joint Intervenors argue in their brief -- for the first time -- that the Licensing Board "ruled that this line of questioning was not germane to Joint Intervenors' Contention 17/26(1)(c)" (evacuation warning system), and that "the adequacy of the telephone system is clearly linked to the evacuation warning system." The record simply does not support either Joint Intervenors' characterization of the Licensing Board's ruling or Joint Intervenors' assertion of the link between the telephone system and the evacuation warning system.50/ And Joint Intervenors provide no citation to the record and no explanation of their statements.

50/ The record evidence shows that the evacuation warning systems, the subject of Contention 17/26(1)(c), consists of "a combination of alert systems (fixed sirens, tone-alert receivers, radios, mobile sirens, and mobile loudspeakers) as well as the Emergency Broadcast System (EBS) and local broadcast media." Prepared testimony of Azzarello, et al. at 9, following Tr. 2218. See also prepared testimony of Myers at 5-7, following Tr. 2258.

The Licensing Board sustained an objection to a single question (it did not rule on a "line of questioning") on the grounds that it was beyond the scope of the only two contentions cited by Joint Intervenors -- Contention 17/26(1)(a) and (d). Neither Joint Intervenors nor the Licensing Board made any reference to Contention 17/26(1)(c). In any event, Joint Intervenors gave no explanation, either during the hearing, in their proposed findings and conclusions, or in their appeal brief, of why the question was within the scope of Contention 17/26(1)(c) or related to Mr. Myers' direct testimony. As discussed in note 7 above, Joint Intervenors may not raise on appeal new arguments which were not raised during the hearings below.

Joint Intervenors have never explained how excessive use of the telephone during an emergency would compromise the ability to notify or warn the public, or would affect the command decision structure. Since the record evidence shows that these systems are designed to utilize communication methods other than the commercial telephone, the significance of the question would have been of no moment in the resolution of the issues before the Licensing Board.

Exception 20 does not therefore identify Licensing Board error, and should be denied.

H. Category (7) - Failure to Allow Cross-Examination of NRC Staff Witnesses on Evacuation Shadow Phenomenon (Exception 27)

Joint Intervenors' Exception 27 presents a very narrow issue -- whether the Licensing Board should have permitted Joint Intervenors to pose questions about the so-called "evacuation shadow phenomenon" to the FEMA witnesses. In presenting the issue, Joint Intervenors have unaccountably failed to advise the Appeal Board that, indeed, the Licensing Board gave full latitude to the parties, including Joint Intervenors, to question another more appropriate NRC witness on the subject. Exception 27 is directed only to a particular instance where the Licensing Board sustained objections to such questioning of witnesses whose testimony and involvement in the emergency plan review processes did not deal with the evacuation shadow phenomenon.

Evacuation shadow is a term used for spontaneous evacuation of areas beyond the area for which an evacuation is ordered. The subject was raised for the first time in this proceeding by the Joint Intervenors during their cross-examination of the NRC Staff's FEMA witnesses on the subject of "hysteria," i.e., whether FEMA witnesses Benton and Lookabaugh had considered the effect of public anxiety when they reviewed the emergency plans. The two witnesses stated in response to

questions by both Joint Intervenors and the Licensing Board that they had not specifically considered "hysteria" in their review of the emergency plans. Tr. 2886-92, 2913-14 (Benton), Tr. 2917-18 (Benton and Lookabaugh).51/ Thereafter, Joint Intervenors asked the two witnesses about the phenomenon of evacuation shadow. The Licensing Board was unquestionably correct in sustaining objections by counsel for FEMA and counsel for the NRC Staff on the grounds that the subject of evacuation shadow had not been addressed by the witnesses in their testimony, and was unrelated to anything they had done in reviewing the emergency plans. Tr. 2918-20.

Here again, Joint Intervenors do not address the basis upon which the Licensing Board sustained objections to the questioning. They simply state, without explanation, that they were not allowed to pursue "this potentially fruitful line of questioning." In fact, Joint Intervenors, as well as the other

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51/ FEMA witness Benson testified that he did not personally take "hysteria" into account when he conducted his evaluation because it was encompassed within the NUREG-0654 criteria against which he evaluated the emergency plans. Tr. 2913-14. This issue was pursued at length by the Licensing Board, and by Joint Intervenors and the other parties, resulting in a clear showing on the record that FEMA and the NRC had indeed taken "hysteria," or public anxiety, into account in the development of the emergency planning criteria in NUREG-0654. See generally Tr. 2913-15 (Benton), Tr. 3014-17, 3275 (Chairman Wolfe), Tr. 3794-3839 (Grimes). The Licensing Board so found, PID at 14-15, 40 (FF 17), and Joint Intervenors took no exception to that finding.

parties, were allowed to address this line of questioning, without limitation, when Mr. Grimes, NRC's Director of Emergency Preparedness, appeared as a witness for the NRC Staff. Mr. Grimes answered all questions put to him about the nature of the evacuation shadow phenomenon and how it was taken into account by FEMA and the NRC when they developed the emergency preparedness criteria in NUREG-0654. Tr. 3802-3, 3818-19, 3837-38 (Grimes). Since the subject, even though not specifically raised by Joint Intervenors in their contentions, was fully aired by Joint Intervenors through an appropriate witness, no prejudice can be said to have resulted.

Thus, the allegation in Exception 27 does not constitute Licensing Board error, and the exception should be denied.

I. Category (8) - Single Mode Evacuation (Exception 28)

In Exception 28, Joint Intervenors have alleged that the Licensing Board erred in "failing to require more than one method of evacuating St. John and St. Charles parishes." Joint Intervenors are incorrect in suggesting that more than one method of evacuation is required.

There are no NRC or FEMA requirements that offsite emergency plans provide for alternative methods of evacuation. Section 50.47(a) of 10 C.F.R. Part 50 requires the NRC, based

on review of FEMA findings and determinations with respect to offsite emergency plans, to make a finding that adequate protective measures can and will be taken in the event of a radiological emergency. The standards to be followed require, inter alia, the development of a range of protective actions, 10 C.F.R. § 50.47(b)(10), of which evacuation is one. The specific criteria which address the standards are in NUREG-0654. 10 C.F.R. § 50.47(b), n.1. While NUREG-0654 contemplates that evacuation would likely be an appropriate protective action to be included in emergency planning, nothing in that document, or in 10 C.F.R. § 50.47(b)(10), requires, or even suggests, that an offsite emergency plan must encompass more than one plan for evacuation. See generally NUREG-0654, § I.D.1.a, at 9; § II.J.8-10, at 61-64; and Appendix 4.

Joint Intervenors, in their sole reference to NUREG-0654, seem to be arguing that, because emergency plans must account for a "spectrum of accidents," and should not be addressed to a "single specific accident sequence," NUREG-0654 therefore requires alternative sets of evacuation routes. The logic defies us. The referenced statements are found in Section I.D.1 of NUREG-0654, at page 6, and clearly relate to a spectrum of accidents, not a spectrum of evacuation methods. In fact, if one continues reading this section at page 7, NUREG-0654 suggests just the opposite of Joint Intervenors

proposition when it states that the planning basis is "independent of specific accident sequences."

In any event, the Emergency Preparedness/Civil Defense Directors testified that -- while their basic planning provides for evacuation generally in opposite directions52/ -- the

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52/ In their brief, Joint Intervenors seem also to be implicitly challenging the reasonableness of the planned evacuation method, even though the issue was not raised in Exception 28 and even though the record does not support their innuendos and allegations.

The evacuation routing, which can best be described by reference to Section 3.5, and the map in Fig. 1, of Applicant Exhibit 4, "Evacuation Time Estimate," flows generally away from the plant in the four quadrants of the 10-mile plume EPZ. If Joint Intervenors are suggesting that St. John the Baptist Parish should evacuate eastward because there may be reasonable eastward routes, one need only consult the map to see that St. John the Baptist Parish lies to the west and north of the plant (which is in St. Charles Parish, near the border between the two parishes). The evacuation routes for St. John the Baptist Parish are, as one would logically expect, to the west and north. Tr. 2672 (Madere). There is no evidence on the record to suggest that this is unreasonable.

If Joint Intervenors are suggesting that St. Charles Parish should evacuate westward, there is no record evidence in support of the merits of such an action or in support of the statement in their brief that there are good methods for evacuating St. Charles Parish westward.

If Joint Intervenors are suggesting that planning to avoid the confusion of both parishes evacuating in the same direction is somehow inconsistent with the objective of dose savings, they have provided no explanation and cited no evidence in support of their proposition. There is no such evidence.

Finally, Joint Intervenors assert that in some cases residents may have to move closer to the plant before evacuating. Again there is no evidence to support the statement, or to support the proposition that, if true, it would be unacceptable.

planning is flexible enough to permit evacuation in any direction, as common sense and conditions at the time of an accident dictate. Tr. 2794-96 (Madere, Lucas). The Licensing Board reflected this testimony, noting that the plans are not "fixed in concrete," and that, depending upon conditions at the time, the local directors "could and would" vary evacuation routes as necessary.

Thus, the Licensing Board did not err by not requiring more than one method of evacuating the plume EPZ.

IV. CONCLUSION

In accordance with the foregoing, Applicant submits that each of the Joint Intervenors' exceptions to the Licensing Board's Partial Initial Decision of November 3, 1982 has either been waived for failure to brief, or is without merit. Accordingly, Applicant respectfully requests that the Appeal

Board deny Joint Intervenors' exceptions and affirm the Licensing Board's Partial Initial Decision.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

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Dated: March 25, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Appeal Board

In the Matter of	)	
	)	
LOUISIANA POWER & LIGHT COMPANY	)	Docket No. 50-382
	)	
(Waterford Steam Electric Station, Unit 3)	)	

CERTIFICATE OF SERVICE

This is to certify that copies of the foregoing "Applicant's Brief in Opposition to Joint Intervenors' Exceptions" were served by deposit in the U.S. Mail, first class, postage prepaid, to all those on the attached Service List, this 25th day of March, 1983.

Dated: March 25, 1983

UNITED STATES OF AMERICA
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