

applicant, resolved all but one contested issue in the case.¹

Joint Intervenors' appeal focuses on the issues of synergism and emergency planning. Synergism is the cooperative action of discrete agents to produce an effect greater than the sum of the effects taken independently. See *id.* at __ (slip opinion at 67-68). Joint Intervenors claim that the radioactive releases from the Waterford 3 nuclear power plant will react synergistically with the industrial (chemical) pollutants of the lower Mississippi River area, causing a higher incidence of cancer than would otherwise be the case. With regard to emergency planning, Joint Intervenors argued before the Licensing Board that the evacuation plans for the parishes surrounding Waterford 3 are inadequate in a number of respects. Here, they primarily assert that the Board erred in numerous procedural rulings. We discuss these two sets of issues, in turn, below and address a third -- decay heat removal -- on

¹ The open issue -- the adequacy of applicant's revised pre-emergency public information brochure (see 10 CFR § 50.47(b)(7)) -- was subsequently resolved in favor of the applicant after further evidentiary hearings. See LBP-83-27, 17 NRC __ (May 26, 1983). Joint Intervenors have recently filed exceptions to this decision.

our own motion.² We conclude by affirming the Board's decision.

I.

SYNERGISM

A. Background

The Waterford 3 nuclear power plant is located in St. Charles Parish on the west bank of the Mississippi River, about 24 miles west of New Orleans, Louisiana. As noted, it is Joint Intervenors' position that that area is subject to chemical pollution from heavy industry, and the addition of radioactive effluents from Waterford 3 will have a multiplying effect on the already high cancer rates there.³ While the Licensing Board agreed that the

² Exceptions not fully briefed by Joint Intervenors are considered waived. Public Service Electric and Gas Co. (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 NRC 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). However, as is our usual practice, we have reviewed those portions of the partial initial decision and underlying record not properly subject to the appeal and, with the exception of the matter on decay heat removal addressed in Part III, infra, have found no error warranting corrective action.

³ Specifically, Joint Intervenors' contention 8/9 alleged.

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

southern Mississippi River corridor exhibits a higher incidence of some cancers than other regions of the United States, it rejected Joint Intervenors' claim that the levels of radiation expected to be released from Waterford 3 will induce a synergistic effect. Id. at ___ - ___ (slip opinion at 28-31).

In order to determine whether radioactive emissions from Waterford 3 might react synergistically with existing environmental pollutants, it is first necessary to develop an estimate of the radiation dose that would be attributable to these routine emissions. Using the GALE computer code,⁴ applicant determined what these emissions would be and then calculated the radiation dose estimate for the average individual in the vicinity of the Waterford 3 plant as less than 0.01 millirem (mrem) per year. Applicant's Testimony, fol. Tr. 461, at 5, Table 2. Both applicant and the NRC staff also calculated estimated doses received by a hypothetical "maximally exposed" individual for the several exposure pathways. For each pathway, the predicted maximum dose was within the design objectives of 10 CFR Part 50, Appendix I. See id. at 4-5, Table 1; NRC Staff Testimony

⁴ The GALE (Gaseous and Liquid Effluent) code reflects the cumulative operating experience of all U.S. nuclear plants through the mid-1970's and is still deemed accurate. It permits consideration of specific plant parameters and assumes that the plant will experience a certain amount of leakage. Tr. 491-97.

of Edward F. Branagan, Jr., fol. Tr. 767, at 2-4; Staff Exh. 1, "Final Environmental Statement" (FES), at 5-27 - 5-31, J-2 - J-3, Table J-5, as corrected at Tr. 738-51. The Licensing Board accepted both the applicant's and the staff's calculations of dose estimates, finding them "very close to each other" and based on commonly accepted methodology. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 27). In the Board's view, when compared to the average 80 mrem per year dose from naturally occurring background radiation near Waterford (see Applicant's Testimony, fol. Tr. 461, at 8), the minute average addition of 0.01 mrem per year could have only a correspondingly minimal health impact.⁵ Thus, the Board found that the additional projected dose from Waterford is "exceedingly unlikely" to cause any synergistic effect and would not measurably increase any synergistic interactions that might already be occurring in the environment. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 30-31).

B. Analysis

Joint Intervenors make essentially a four-pronged attack on the Board's decision. They claim that (1) the

⁵ The Board also noted that the estimated doses from Waterford calculated by applicant and the staff were smaller than even the 20 mrem per year variation in the natural background radiation dose. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 30-31). See Applicant's Testimony, fol. Tr. 461, at 8.

dose estimate employed by the Board is erroneous; (2) their evidence, which the Board ignored, supports a finding of synergism; (3) the staff and applicant witnesses were biased and unqualified; and (4) the Board committed procedural error by placing the burden of proving synergism on Joint Intervenors rather than disproving synergism on the applicant.

1. Dose Estimate

Joint Intervenors argue that the radiation dose estimate should be derived from the Commission regulations that specify the design objectives for nuclear power plants -- 10 CFR Part 50, Appendix I -- rather than the calculated values based on anticipated operating experience that were employed by the staff and applicant. On cross-examination, Joint Intervenors asked staff witness Dr. Edward F. Branagan, Jr., to sum those Appendix I design objective values. He calculated a whole body dose of 23 mrem for all pathways and all types of effluents. Tr. 879-80, 1014.⁶ It is this value that Joint Intervenors urge be used to assess the possibility of synergistic interactions.

We disagree. First, the Appendix I design objectives represent a conservatively determined maximum exposure for

⁶ We note that Dr. Branagan included a 15 mrem dose to the thyroid in his computation of a whole body dose, yet the thyroid dose is obviously only an organ dose. In effect, he was adding apples and apple trees, thereby distorting the total value.

each pathway. It is extremely unlikely that any real individual would receive any one of these doses, much less the sum of all of them. Tr. 999-1003, 1014.⁷ For this reason alone the Appendix I design objectives do not provide a realistic estimate of the expected radiological impact of operation of Waterford 3 or any other plant. Moreover, in terms of the radiological consequences of the operation of Waterford 3, the total population dose -- here characterized as the average dose to persons within a 50-mile radius -- is the more telling consideration. Determination of a maximum dose for each radioactive effluent pathway ensures that the possibly higher dose that may be received by an individual, or class of individuals, in the immediate vicinity of the plant will not be obscured by the averaging. But the total population dose also must be considered to establish the general population risk associated with plant operation -- even where, as here (see pp. 4-5, supra), the pathway maximum doses are within the prescribed limits. See

⁷ As well as adding the Appendix I values, Dr. Branagan summed the calculated doses predicted for operation of Waterford 3 and determined that, at maximum, an individual might receive a dose of 6 mrem per year. Tr. 1000. But even this estimate is quite high. In order to receive a dose of that magnitude the individual would have to obtain all his or her food and water from each of several different sources that, for the particular exposure pathway analyzed, had the highest effluent levels from Waterford 3. Tr. 1010. See generally Tr. 1006-10.

generally Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Reactor Effluents, CLI-75-5, 1 NRC 277, 298-300 (1975). Applicant and the staff both determined total population dose in this case. We find that an appropriate technique for analyzing what, if any, synergistic effect might be attributable to operating Waterford 3.⁸

2. Evidence on Synergism

a. Staff and Applicant Witnesses

The staff and applicant witnesses converted population dose estimates to risk values (i.e., detrimental health effects) generally by using the correlations of the BEIR III report.⁹ These witnesses, in particular, Dr. Marvin Goldman for the staff and Dr. Leonard Hamilton for the applicant, also addressed the synergism question. See Applicant's Testimony, fol. Tr. 461, at 10-15; NRC Staff

⁸ In any event, even at the higher dose estimate that Joint Intervenors urge (23 mrem), the evidence does not reveal a synergistic effect. See pp. 8-19, infra.

⁹ Committee on the Biological Effects of Ionizing Radiations (BEIR III), The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980, National Research Council, National Academy of Sciences.

Testimony of Dr. Marvin Goldman, fol. Tr. 735, at 3-4, 9-15. They noted that a number of experiments using animal cells have demonstrated an "enhancement" of effects when radiation and a chemical agent act together. The experiments, however, utilized radiation doses 10,000 to 100,000 times (or more) higher than the predicted doses to the maximally exposed individual from Waterford 3. Applicant's Testimony, fol. Tr. 461, at 13-14; NRC Staff Testimony of Dr. Marvin Goldman, fol. Tr. 735, at 10-12, 14.

Because of this tremendous difference between the doses used in the laboratory experiments and those conservatively expected from operation of Waterford 3, Drs. Goldman and Hamilton were unable to find any synergistic effect at Waterford based on the available data.¹⁰ Moreover, even if there were such an effect, because the doses attributable to Waterford are so very small, any enhancement would also be small, so small as to be insignificant. Applicant's

¹⁰ Indeed, none of the staff and applicant witnesses was willing to accept that the laboratory experiments demonstrated synergism in humans from the combined effects of environmental carcinogens and radiation at millirem dose levels. The only acknowledged evidence of synergism in humans is that between cigarette smoking and lung radiation exposure in uranium miners. See NRC Staff Testimony of Dr. Marvin Goldman, fol. Tr. 735, at 13, 14. But Dr. Jacob I. Fabrikant, an applicant rebuttal witness, pointed out that the uranium miner lung doses were very high (in the range of 1000 rem) and that the latest data appear to show that the effects of smoking and radiation exposure are additive, rather than synergistic. Tr. 3649-52.

Testimony, fol. Tr. 461, at 10, 14-15; NRC Staff Testimony of Dr. Marvin Goldman, fol. Tr. 735, at 3, 12-13, 14-15; Tr. 715-17. Further, Dr. Goldman testified that the existing data seem to converge at a certain point, creating a "threshold effect" where no enhancement occurred -- i.e., cell transformation did not occur until the 50 to 100 rad level.¹¹ In Dr. Goldman's view, any extrapolation of enhanced effects (i.e., synergism) from high to low doses would be non-linear, showing the enhancement as diminishing exponentially. Thus, at very low doses, such as those attributable to Waterford, any effect would be indistinguishable from an unenhanced effect. Tr. 942, 950-51, 971-72, 975, 988-89. Dr. Hamilton also pointed out that the population of southeastern Louisiana (like populations elsewhere) is exposed continually to background levels of radiation many times greater than those attributable to Waterford. See p. 5, supra. Thus, to the extent that any synergistic enhancement might exist, the environmental pollutants would already be interacting with the natural background radiation, and any addition to such

¹¹ For the purpose of this discussion, x-ray doses in synergism experiments (rads) and human doses (rems) can be considered to represent the same amount of radiation exposure or dose. Thus, 50 rad, for example, is the equivalent of 50 rem or 50,000 mrem.

effects from Waterford 3 would be "miniscule." Applicant's Testimony, fol. Tr. 461, at 10, 14-15.

b. Joint Intervenors' Witnesses

The testimony presented by Joint Intervenors did not raise a serious question about the correctness of the applicant and staff positions. However, because the Licensing Board referred directly to the testimony of only one of Joint Intervenors' four witnesses -- Dr. Velma L. Campbell, who testified to the existence of higher than normal cancer rates in southern Louisiana -- we are constrained to set forth the evidence in more detail. See LBP-82-100, supra, 16 NRC __ (slip opinion at 25-31, 66-67).¹²

¹² Hence, Joint Intervenors' complaint that the Board failed to consider the testimony of their witnesses is, in a sense, well founded. "We long ago reminded licensing boards of their duty not only to resolve contested issues, but 'to articulate in reasonable detail the basis' for the course of action chosen A board must do more than reach conclusions; it must 'confront the facts.'" Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), ALAB-422, 6 NRC 33, 41 (1977), aff'd, CLI-78-1, 7 NRC 1 (1978) (citations omitted). Where, as here, an intervenor makes a sincere effort to pursue its case by sponsoring the appearance of a number of witnesses, the board has some obligation at least to refer to the particular arguments raised by the witnesses, and to explain why they were not accepted or were deemed to be less persuasive than those of other parties. Despite those deficiencies in the Licensing Board's opinion here, however, "the decision below need not necessarily be reversed . . . for we have authority to make factual findings on the basis of [the] record evidence." Id. at 41-42. Our own review of the record, in other words, will determine the outcome of the case.

In addition to Dr. Campbell, Joint Intervenors presented Dr. Irwin D. J. Bross on the issues of radiation health effects and synergism (fol. Tr. 1342); Dr. Carl Johnson, on the adverse health effects of radiation, radiation dose estimates, and synergism (fol. Tr. 1836); and Dr. Hemchandra Pandit on radiation health effects and synergism (fol. Tr. 1218).¹³ We have reviewed all of Joint Intervenors' testimony and, for the reasons set out

¹² (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)

Joint Intervenors also complain that the Licensing Board failed to address several "limited appearance" statements (see 10 CFR § 2.715(a)). Joint Intervenors' Brief (Feb. 4, 1983) at 31. But as we pointed out a decade ago, limited appearance statements do not constitute evidence and, accordingly, the Board was not obligated to discuss them in its decision. See Iowa Electric Light & Power Co. (Duane Arnold Energy Center), ALAB-108, 6 AEC 195, 196 n.4 (1973). The purpose of such statements is "to alert the Board and the parties to areas in which evidence may need to be adduced." Ibid. Our review of the statements to which Joint Intervenors refer convinces us that the Board properly pursued at the hearing any "relevant and meritorious questions" raised by persons making a limited appearance. See 10 CFR Part 2, Appendix A, § V(b)(4).

¹³ Joint Intervenors also sought to call Dr. Samuel S. Epstein, but Dr. Epstein was unwilling to appear at the hearing. Tr. 351. The Board acted well within its discretion in refusing to accept Dr. Epstein's prefiled written testimony as evidence in the absence of his personal appearance for cross-examination at the hearing. Tr. 363-65. See generally 10 CFR § 2.718; Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant Unit 2), ALAB-27, 4 AEC 652, 658-59 (1971). In any event, the material on synergism sought to be presented by Dr. Epstein (which the Board accepted as a limited appearance statement) is unspecific and generally cumulative of evidence presented by other witnesses. See Tr. 436-50.

below, are of the opinion that the conclusions reached by the Licensing Board are correct.

Dr. Campbell is a practicing physician in New Orleans. Her testimony was directed to showing the existence of higher than normal cancer rates in the New Orleans area due to chemical pollutants in the waters of the Mississippi River. See Testimony of Dr. Velma L. Campbell, fol. Tr. 1055. The Licensing Board accepted that position as accurate, despite lengthy cross-examination that tended to cast doubt on some of her conclusions. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 28-29). See Tr. 2039-101, 2110-18.

We need not decide whether Dr. Campbell's position has enough support in the evidence, for the resolution of the synergism issue is founded on the extremely low levels of radiation exposure to the population likely to result from the operation of Waterford 3, and not on whether the same population is exposed to excessive chemical pollutants. Again, we point out that the existing cancer rate data are already influenced by natural background radiation levels many times in excess of the anticipated Waterford 3 contribution. Synergistic effects, if they exist at these very low levels, are already reflected in the health risk data. See pp. 8-11, supra.

Joint Intervenors' next witness, Dr. Bross, is Director of Biostatistics at Roswell Park Memorial Institute for

Cancer Research in Buffalo, New York. Dr. Bross' principal attempt¹⁴ to demonstrate radiation/chemical pollutant synergism relies on an analogy between the Waterford plant on the bank of the Mississippi River and nuclear power plants found along polluted river systems in the Soviet Union. Statement of Dr. Irwin D. J. Bross, fol. Tr. 1342, at Questions 29-34, 51.¹⁵ Based upon two newspaper articles, Dr. Bross asserts that there may well have been a synergistic increase in infant mortality attributable to chemical pollution in Soviet rivers and the nuclear power

¹⁴ To illustrate a "synergistic" effect, Dr. Bross, in passing, refers to a 1981 report in Science based on data from the children of Japanese A-bomb survivors. Statement of Dr. Irwin D. J. Bross, fol. Tr. 1342, at Questions 35-37, Appendix A. (Dr. Bross' unpaginated testimony, like that of Joint Intervenors' other witnesses, is in the form of answers to numbered questions, as our citation form reflects.) But Dr. Bross himself recognizes that the paper relates only to radiation exposure, not to chemical carcinogens, and therefore does not bear upon our present considerations. See id. at Question 35.

¹⁵ Dr. Bross also considers the radiation risk estimates used by applicant and the staff to be understated. Id. at Questions 18-19. The record demonstrates very clearly, however, that Dr. Bross' theories regarding the health risks of radiation exposure have been widely criticized and rejected by respected members of the medical and radiological health community. See, e.g., Tr. 1604-37. See also Applicant's Rebuttal Testimony of Dr. George B. Hutchison (Professor of Epidemiology, Harvard University School of Public Health), fol. Tr. 3411, and of Dr. Jacob I. Fabrikant (Professor of Radiology, University of California School of Medicine at San Francisco), fol. Tr. 3627. The overwhelming weight of the scientific evidence of record supports the radiation risk estimates adopted by applicant and the staff.

plants located along these rivers. By extrapolating from this experience -- concededly a "rough qualitative assessment" -- Dr. Bross stated that similar effects can be projected for Waterford. Id. at Question 29.

Neither newspaper source points to any connection between the infant mortality rate and nuclear power. See Tr. 1563-68, 1746-48. Moreover, Dr. Bross made no study of, and showed no familiarity with, infant mortality in Russia, reactor siting, or the release of reactor effluents in the

Soviet Union. Tr. 1543-78.¹⁶ We find that his testimony

¹⁶ The following excerpts from the cross-examination of Dr. Bross are illustrative:

Q. Have you ever seen a single calculation of the effluents released from a Russian nuclear powerplant?

A. You mean, corresponding to the sort of things here, no. . . .

Q. Dr. Bross, what is the basis for your knowledge regarding effluents from Russian nuclear powerplants?

A. None specific. (Tr. 1558.)

Q. What are the infant mortality rates currently in Russia?

A. Well, I don't remember the exact numbers. They are up towards 30, the high 20's. I think it's around 29, but maybe -- It's up in that range. And earlier in Russia the rates were substantially lower -- to the low 20's. (Tr. 1563.)

Q. Do you recall whether or not the article which you read provided any distribution of the infant mortality rates in Russia?

A. No.

Q. Provided any information with regard to where the infants obtained their drinking water in Russia?

A. No.

Q. And you have no independent knowledge of that as well?

A. No.

Q. Do you know what the primary causes for infant mortality are in Russia?

A. You mean to name the diseases or -- Is that what you're asking for?

is pure conjecture.

Dr. Carl Johnson, Associate Clinical Professor of Social and Environmental Health at the University of Colorado College of Medicine, is generally critical of the health risk estimates that have been made in connection with projected routine radiation releases from Waterford. He suggests that insufficient attention has been given to the food, air, and water pathways as potential sources of human exposure. Testimony of Dr. Carl Johnson, fol. Tr. 1836, at Questions 13, 18, 19, 21, 22.¹⁷

A principal source of Dr. Johnson's criticism of the health risk estimates is a study by the Heidelberg (West Germany) Institute for Energy and Environmental Research. Dr. Johnson's cross-examination, however, revealed his lack

¹⁶ (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)

Q. Do you know what the primary causes for infant mortality are in Russia?

A. Specifically, no.

Q. Have you made any studies regarding chemical discharges from plants in Russia?

A. No. (Tr. 1565.)

¹⁷ Dr. Johnson's contribution to the synergism issue is a brief discussion of the uranium miners smoking study (see note 10, supra), and an unrelated conclusory statement that one could expect the same effect in Louisiana as a result of Waterford 3. "Support" for Dr. Johnson's conclusions is found in several unidentified publications that assertedly address this problem. Testimony of Dr. Carl Johnson, fol. Tr. 1836, at Questions 11, 20. See also Tr. 1966-71, 2026.

of familiarity with the methodology of that study and the extent of its acceptance vel non by the scientific community. Tr. 1948-54. Dr. Johnson was similarly unacquainted with the Commission's regulations on the control of radiation emissions and the methodology for determining dose estimates. He was also not aware of the staff's and applicant's consideration of all the various ingestion pathways in their population dose estimates for Waterford (see pp. 4-5, supra), nor has he attempted to determine such estimates on his own. See Tr. 1853-55, 1875-76, 1886-87, 1901-12, 1947, 1964-65, 1994-95, 2002-03, 2006-07. In short, we find Dr. Johnson's testimony to be of essentially no value with respect to the staff and applicant dose estimates for Waterford 3.

Finally, we have reviewed the testimony and resume of Joint Intervenors' witness, Dr. Hemchandra Pandit, Professor of Biology at D'Youville College, Buffalo, New York. Dr. Pandit suggested that synergistic actions between toxic chemical waste and radioactive waste occurred at the Love Canal and could occur at Waterford. Testimony of Dr. Hemchandra Pandit, fol. Tr. 1218, at Questions 15-16. But under cross-examination he was unable to substantiate this view. Tr. 1231-38. Nor was he familiar with the radiation dose values determined for Waterford. Tr. 1239. We believe Dr. Pandit was at best marginally qualified to testify in

this proceeding and find that the Board correctly disregarded the substance of his testimony.

In sum, Joint Intervenors' testimony did little to detract from the cases presented by applicant and the staff. The great weight of the evidence supports the Licensing Board's conclusion that the radiation dose from Waterford 3 will average about 0.01 mrem per year -- a dose so low that, if synergism were to occur at this level, it is exceedingly unlikely to cause any measurable enhancement in preexisting effects.

3. Bias and Lack of Qualifications

Joint Intervenors argue that the witnesses put forward by the staff and applicant were either unqualified or biased. They assert generally that "[t]he Board erred in relying upon the testimony of the NRC and [applicant] witnesses who have a pecuniary interest in nuclear power and radiation." Joint Intervenors' Br. at 2. The argument is without merit.

The fact that a witness is employed by a party, or paid by a party, does not disqualify the witness from testifying or render the testimony valueless. In order for expert testimony, such as we have here (see pp. 20-22, infra), to be admissible, it need only (1) assist the trier of fact, and (2) be rendered by a properly qualified witness. See Fed. R. Evid. 702; Duke Power Co. (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 NRC 453, 475

(1982). It should come as no surprise that most expert witnesses do receive compensation from the parties on whose behalf they testify. But their compensation is for their time and expertise, not for their testimony as such. There is nothing wrong or inherently suspect about that. To be sure, as was done here, the opposing party can elicit the fact that a witness has been paid for his or her appearance, or is employed by a party. But that line of attack goes only to the persuasiveness or weight that should be accorded the expert's testimony, not to its admissibility. See 11 J. Moore & H. Bendix, Moore's Federal Practice ¶ 702.30[1] (2d ed. 1982).¹⁸

Joint Intervenors' more particularized objections to the qualifications and credibility of Drs. John Mauro and Leonard Hamilton for the applicant, and Dr. Marvin Goldman for the staff, are also wide of the mark. We need give only a few examples. Joint Intervenors assert that Dr. Mauro,

¹⁸ If anything, there is an additional safeguard against bias in NRC licensing proceedings because of the staff's special responsibilities. The Commission and its adjudicatory boards have on more than one occasion stressed that the "staff has the obligation to lay all relevant materials before the Board to enable it adequately to dispose of the issues before it." Consolidated Edison Co. of New York (Indian Point Station, Units 1, 2 and 3), CLI-77-2, 5 NRC 13, 15 (1977). See generally Tennessee Valley Authority (Browns Ferry Nuclear Plant, Units 1, 2 and 3), ALAB-677, 15 NRC 1387 (1982); Allied-General Nuclear Services (Barnwell Nuclear Fuel Plant Separations Facility), ALAB-296, 2 NRC 671, 680 (1975).

who has been involved for eight years in assessing the offsite radiation doses that can be expected from Waterford 3, "has never taken a biology course." Joint Intervenors' Br. at 2. In fact, Dr. Mauro has a B.S. degree in Biology from Long Island University, in addition to an M.S. in Biology/Health Physics and a Ph.D. in Health Physics from New York University. He has 45 graduate credits in biology and is plainly qualified to calculate an estimated radiation dose from Waterford 3. Applicant's Testimony, fol. Tr. 461, at 3, Resume of John J. Mauro; Tr. 480.¹⁹

Joint Intervenors' criticism of the credentials of Drs. Hamilton and Goldman -- both of whom testified that it was exceedingly unlikely that the expected releases from Waterford 3 would cause any synergistic effect (see pp. 8-11, supra) -- is no more persuasive. We have previously noted that "Dr. Hamilton's expert qualifications in the appraisal of radiation health risks are beyond cavil."

¹⁹ Joint Intervenors also assert that Dr. Mauro

conducted no studies of radiation in the Mississippi River. As the most dangerous pathway for radioactive effluents is ingestion via food or drinking water, this omission is extremely serious.

Joint Intervenors' Br. at 2. In fact, Dr. Mauro's analysis assumes that persons obtain all their seafood and drinking water from the plant's discharge canal leading into the river, a source of more concentrated radioactivity than the Mississippi River itself. Applicant's Testimony, fol. Tr. 461, at 5; Tr. 497-98, 604.

Philadelphia Electric Co. (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-701, 16 NRC ____, __ (Nov. 19, 1982) (slip opinion at 16). His curriculum vitae reflects the facts that he holds a doctorate in experimental pathology from Cambridge University and an M.D. degree from Oxford University. He has been involved in assessing the human risks from radiation for the past 35 years. Applicant's Testimony, fol. Tr. 461, at 9, Resume of Dr. L. D. Hamilton. Dr. Hamilton plainly is qualified to speak to those risks in this case.²⁰ Dr. Goldman's credentials are equally impressive. He is a Professor of Radiobiology at the University of California at Davis. He has more than 30 years experience in radiation research and has authored over 100 papers and reports on radiation-related topics. NRC Staff Testimony of Dr. Marvin Goldman, fol. Tr. 735, at 1, Resume of Marvin Goldman.²¹

²⁰ Joint Intervenors also contend that Dr. Hamilton did not know the expected radiation dose from Waterford 3. Joint Intervenors' Br. at 4. Dr. Hamilton's prepared testimony is part of a panel presentation that included Dr. Mauro's dose estimate of less than 0.01 millirem per year. Dr. Hamilton refers to this figure at least three times in answering questions on cross-examination. Tr. 637, 639, 683.

²¹ Joint Intervenors argue that Dr. Goldman's credibility and competence were "severely compromised by his gross misrepresentation" of the amount of synergistic enhancement observed in one of the laboratory experiments. Joint Intervenors' Br. at 7. Dr. Goldman referred to an eight or ninefold enhancement, when the report refers to an

4. Burden of Proof

Joint Intervenors also argue that the Board improperly allocated the burden of proof by placing the burden of proving synergism on them. Joint Intervenors' Br. at 24-27. That argument does not fairly characterize the Licensing Board's decision. We had the occasion to deal with a virtually identical claim a decade ago. The discussion is apt here.

The final point on synergism made by the Saginaw Intervenors is that the burden of proof on this issue was "misplaced;" and that the Board required the intervenors to "demonstrate there was a problem of synergism rather than, as is required by the Rules, having Applicant and the Regulatory Staff demonstrate

21 (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)
enhancement by a factor of 19. See NRC Staff Testimony of Dr. Marvin Goldman, fol. Tr. 735, at 10; Tr. 946-48; Kennedy, Mondal, Heidelberger, & Little, Enhancement of X-ray Transformation by 12-O-Tetradecanoyl-phorbol-13-acetate in a Cloned Line of C3H Mouse Embryo Cells, 38 Cancer Research 439, 440 (1978). But the error, when called to Dr. Goldman's attention, did not alter his testimony -- i.e., that regardless of the amount of ultimate enhancement, there was no cell transformation observed in the experiment until the 50 to 100 rad level, and extrapolation downward to the much lower levels of radiation involved here is not feasible. Tr. 950-53. See p. 10, supra. In these circumstances, we do not view Dr. Goldman's error as casting significant doubt on his overall testimony.

Joint Intervenors also make much of the number of corrections that were made to Dr. Branagan's testimony. Joint Intervenors' Br. at 28, 30-31. See Tr. 738-51. While it is disappointing that the prepared testimony was not more accurate, the changes were typographical and did not significantly affect the staff's radiation dose estimates or its conclusions on health risks. Hence, Joint Intervenors were not prejudiced by the changes, and the Board did not err in allowing the corrections to be made for the sake of a more accurate record.

that there is no problem with synergism." Here intervenors misinterpret the requirements of the rules.

The ultimate burden of proof on the question of whether the permit or license should be issued is, of course, upon the applicant. But where, as here, one of the other parties contends that, for a specific reason (in this instance alleged synergism) the permit or license should be denied, that party has the burden of going forward with evidence to buttress that contention. Once he has introduced sufficient evidence to establish a prima facie case, the burden then shifts to the applicant who, as part of his overall burden of proof, must provide a sufficient rebuttal to satisfy the Board that it should reject the contention as a basis for denial of the permit or license. In this case, the Licensing Board determined not only that the intervenors had failed to make a prima facie showing of synergistic effects, but also that the applicant's evidence affirmatively established that synergism would not occur.

Consumers Power Co. (Midland Plant, Units 1 and 2), ALAB-123, 6 AEC 331, 345 (1973) (footnote omitted). As the evidence recounted earlier demonstrates, applicant and the staff introduced persuasive evidence for the proposition that, if any synergism takes place at the millirem levels involved here, the enhancement effect is essentially nil. Thus, to the extent Joint Intervenors' evidence even established a prima facie case, it has been rebutted, and there has been no improper shift of the burden of proof.

II.

EMERGENCY PLANNING

In the wake of the March 1979 accident at Unit 2 of the Three Mile Island facility, the Commission undertook "a formal reconsideration of the role of emergency planning in ensuring the continued protection of the public health and safety in areas around nuclear power facilities." 45 Fed. Reg. 55402 (Aug. 19, 1980). Accordingly, the Commission promulgated regulations requiring, prior to the issuance of an operating license, a finding of "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." 10 CFR § 50.47(a)(1). Adequate protective measures for offsite, as well as onsite, are required.²² The Emergency Planning Zone (EPZ) concept, adopted as an added conservatism to the Commission's "defense-in-depth" philosophy,²³ provides the means of implementing offsite emergency preparedness. 45 Fed. Reg. at 55406.²⁴ The regulations set forth 16

²² The Commission bases its overall "reasonable assurance" finding on a review of the Federal Emergency Management Agency (FEMA) determination of the adequacy of offsite (state and local) planning, and on the NRC staff assessment of the adequacy of an applicant's onsite plan. 10 CFR § 50.47(a)(2).

²³ See Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), CLI-74-40, 8 AEC 809, 813 (1974).

²⁴ There are two emergency planning zones -- (i) the plume

emergency planning standards and define the areas of responsibility of the licensee and state and local organizations concerned with emergency responses. 10 CFR § 50.47(b). See also 10 CFR Part 50, Appendix E. In addition, NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Rev. 1 (November 1980), prepared jointly by the NRC and FEMA, provides guidance for developing and reviewing emergency plans.

As a consequence of this increased regulatory attention on emergency preparedness, litigation concerning the adequacy of the emergency plans of applicants and the appropriate governmental entities has assumed a large role in many NRC licensing proceedings. Waterford is no exception. Indeed, the major part of the hearing below and the Licensing Board's partial initial decision was devoted to Joint Intervenors' two emergency planning contentions.

As pertinent here, the broader of those contentions challenged only the adequacy of the evacuation plans for the

24 (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)
exposure pathway EPZ, which is an area with a radius of about 10 miles from the plant, and (ii) the ingestion pathway EPZ, which is about 50 miles in radius.
10 CFR § 50.47(c)(2). See Cincinnati Gas & Electric Co. (Wm. H. Zimmer Nuclear Power Station, Unit No. 1), ALAB-727, 17 NRC ___, ___ (May 2, 1983) (slip opinion at 4-5).

plume EPZ in the event of a serious reactor incident at Waterford.²⁵ Specifically, contention 17/26(1) alleged:²⁶

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

²⁵ The other contention, 17/26(2), claimed that applicant has not adequately provided for distribution of potassium iodide, which is used as protection against thyroid irradiation. The Licensing Board concluded that "the State of Louisiana's public health policy decision not to provide [potassium iodide] to the general public is reasonable and is not inconsistent with the guidance provided by FEMA and the NRC." LBP-82-100, *supra*, 16 NRC at ___ (slip opinion at 24). See also *id.* at ___, ___ - ___ (slip opinion at 32, 57-64). Joint Intervenors do not pursue this matter on appeal, and we see nothing in the Board's decision on this point requiring corrective action.

²⁶ This contention was the result of several revisions and the combination of two of the Joint Intervenors' original contentions. The Licensing Board approved it for litigation as it appears above in an unpublished Memorandum and Order (January 15, 1982).

that the provisions for moving individuals are not actually tested;

(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.

Joint Intervenors sponsored no witnesses in support of this contention; they chose instead to make their case solely through cross-examination of the applicant and staff witnesses. LBP-82-100, supra, 16 NRC at __ n.12 (slip opinion at 11 n.12).

At the close of the hearings, the Licensing Board found the record on the contested emergency planning issues complete, except for part (a) of contention 17/26(1), concerning provisions for notifying residents about evacuation.²⁷ Otherwise, the Board concluded that, subject to four specified conditions, applicant's emergency plans comply with the Commission's regulations and provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Id. at __ (slip opinion at 69-70).²⁸ In reaching this

²⁷ See note 1, supra.

²⁸ The four conditions concern: (1) designation of the applicant's official responsible for providing protective

determination, the Board reviewed the evidence and found each part of Joint Intervenors' emergency planning contentions to be without merit. See id. at ___ - __, __, ___ - ___ (slip opinion at 11-24, 32, 36-64).

On appeal from LBP-82-100, Joint Intervenors object principally not to the emergency plan itself, but rather to certain of the Licensing Board's procedural rulings during the hearing.²⁹ Specifically, most of Joint Intervenors' arguments relate to the denial of cross-examination on various issues. We will address these arguments together first, before turning to Joint Intervenors' other claims of error.

A. Denial of Cross-examination

Because Joint Intervenors had no emergency planning witnesses of their own, cross-examination of applicant and staff witnesses was crucial to the development of the Joint

²⁸ (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)
 action recommendations to offsite authorities; (2) submission of letters of agreement with appropriate authorities for vehicles and drivers necessary to implement the evacuation plans; (3) evacuation of prisoners; and (4) information about evacuation pickup points. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 71), as modified, LBP-82-112, 16 NRC ___ (Dec. 14, 1982).

²⁹ Joint Intervenors' only objection to the plan itself relates to its "single mode" method of evacuation. Joint Intervenors' Br. at 44-45. (The part of Joint Intervenors' brief devoted to emergency planning is not paginated; we have continued numbering the pages following the first part of the brief accordingly.)

Intervenors' case.³⁰ Thus, the emphasis they give this matter on appeal is understandable.

Cross-examination must be limited to the scope of the contentions admitted for litigation and can appropriately be limited to the scope of direct examination. Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-673, 15 NRC 688, 698, affirmed, CLI-82-11, 15 NRC 1383 (1982); Prairie Island, ALAB-244, supra note 30, 8 AEC at 867, 869 n.16. In exercising its discretion to limit what appears to be improper cross-examination, a licensing board may insist on some offer of proof or other advance indication of what the cross-examiner hopes to elicit from the witness. Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-461, 7 NRC 313, 316 (1978); San Onofre, ALAB-673, supra, 15 NRC at 697; Prairie Island, ALAB-244, supra, 8 AEC at 869. Even if cross-examination is wrongly denied, however, such denial does not constitute

³⁰ In Northern States Power Co. (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-244, 8 AEC 857, 868 (1974), reconsideration denied, ALAB-252, 8 AEC 1175, affirmed, CLI-75-1, 1 NRC 1 (1975), we recognized that "[p]roper cross-examination can be an especially valuable tool in the [development of a full record]." Moreover, the Commission's rules and case law have long recognized an intervenor's right to make its case defensively. Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B, and 2B), ALAB-463, 7 NRC 341, 356 (1978).

prejudicial error per se. San Onofre, CLI-82-11, supra, 15 NRC at 1384. The complaining party must demonstrate actual prejudice -- i.e., that the ruling had a substantial effect on the outcome of the proceeding. San Onofre, ALAB-673, supra, 15 NRC at 697 & n.14. In each instance here, Joint Intervenors have failed to prove either error in the Board's rulings or actual prejudice to their case.

1. Joint Intervenors contend that they were wrongly denied an opportunity to cross-examine certain witnesses about people who might refuse to evacuate in an emergency. Joint Intervenors' Br. at 35-37. Specifically, Joint Intervenors claim that, although the Licensing Board permitted applicant's counsel to pursue similar questions, they were not allowed to ask applicant's witness, John M. Lucas, Director of the St. Charles Parish Department of Emergency Preparedness, how much of his resources would be devoted to picking up persons who refused to evacuate. See Tr. 2724. Joint Intervenors' argument seems to be that many people will refuse to leave their homes in a nuclear emergency, and substantial state and local resources will have to be devoted to their forcible removal -- leaving fewer resources to carry out the overall emergency plan. See Tr. 2722, 2724-25. Instead of letting Joint Intervenors pursue this matter, the Licensing Board "relied completely on the unsupported opinion of . . . [Mr.] Lucas that few people would refuse to evacuate and there would be no

diversion of Parish resources." Joint Intervenors' Br. at 35. See LBP-82-100, supra, 16 NRC at __, __ (slip opinion at 13, 39). In Joint Intervenors' view, extensive publicity "downplaying the hazards of radiation" and the fact that one-third of the people refused to evacuate during a recent chemical spill in St. Charles Parish, as demonstrated in the record, show the fallacies in Mr. Lucas' reasoning. Joint Intervenors' Br. at 36-37.

Contrary to Joint Intervenors' assertions, the Board's finding that few people would disregard an evacuation order and that therefore there would be no diversion of resources, is amply supported by the record. Three experts in emergency planning³¹ testified that this was not expected to be a problem that could not be handled under the existing plans. Tr. 2723-24, 3034, 3036-39, 3800-02.³² Moreover, in their view, increased publicity and education about

³¹ Mr. Lucas; Bertram Paul Madere, St. John the Baptist Parish Civil Defense Director; and Brian K. Grimes, then-Director of the NRC Division of Emergency Preparedness.

³² As an example of how such a matter would be handled, Mr. Lucas referred to a recent tank car chemical spill, in which three out of nine families in a small subdivision refused to evacuate. Tr. 2717-19. He later elaborated on the peculiar facts of this incident, which lasted about a week. On the first day, pursuant to "advice," all families evacuated. They subsequently returned, only to be advised to leave again. At this point, three families (one with a kennel of dogs) refused to go. The Parish eventually physically moved them (and the dogs). Tr. 3035-36, 2718.

nuclear plants have heightened public awareness so that people will be more -- not less -- likely to cooperate with officials. Tr. 2723-24, 3801-02. Joint Intervenors have not directed our attention to any part of the record that would undermine the testimony of these experts.³³

In any event, it is by no means clear what part, if any, of contention 17/26(1) relates to persons who might refuse to evacuate, and Joint Intervenors do not tell us here. Thus, because this matter is apparently beyond the scope of their contention, the Licensing Board acted well within its discretion in denying Joint Intervenors' single inquiry about the amount of resources to be devoted to persons refusing to evacuate. See p. 30, supra. Indeed, far from foreclosing this matter completely, the Board was rather generous in letting Joint Intervenors pursue this line of questioning. See Tr. 2714-25.³⁴ As for the questioning by applicant permitted by the Board, it was largely repetitive of the matters raised by Joint

³³ In fact, counsel for Joint Intervenors explicitly acknowledged the expertise of one of these witnesses, Mr. Lucas. Tr. 2245.

³⁴ The Licensing Board, too, doubted that this was within the scope of the contention, but nonetheless allowed cross-examination and discussed the matter under contention 17/26(1)(b). LBP-82-100, supra, 16 NRC at __, __ (slip opinion at 13, 39).

Intervenors' cross-examination and thus was within the scope of permissible redirect. See Tr. 3034-39.

2. Joint Intervenors claim that the Board erroneously denied their right to question four key emergency personnel about the consequences of a severe nuclear accident. See Tr. 2189-98, 2236-43, 2253-55, 2269-83, 2710-12.³⁵ As Joint Intervenors see it, lack of education about the consequences of such an event contributes to poor emergency response. They cite the Kemeny Commission Report on the Three Mile Island accident; testimony by NRC staff witness Grimes (Tr. 3760); NUREG-0654; and NUREG-0396/EPA 520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants" (December 1978), as support for their view. Joint Intervenors' Br. at 37-38.

The Licensing Board gave three grounds for precluding Joint Intervenors from asking various emergency planning witnesses about the consequences of a nuclear accident: (1) this matter is beyond the scope of the very specific

³⁵ The witnesses involved were: Robert G. Azzarello, Engineer-Nuclear, Louisiana Power & Light Project Support Group; Robert William Myers, Environmental Program Specialist, Louisiana Department of Natural Resources, Office of Environmental Affairs, Nuclear Energy Division; Mr. Madere; and Mr. Lucas.

contention at issue; (2) the questions are beyond the scope of the direct examination; and (3) severe accidents have already been taken into account in NUREG-0654. Tr. 2276-77, 2712. We see no prejudicial error in the Board's ruling. This is not to say that we disagree with Joint Intervenors' argument that individuals with emergency planning duties should have some knowledge about the consequences of a nuclear accident. The nature of the incident is a key determinant of the type of response to be ordered. Thus, several witnesses (including Mr. Grimes) testified that it was important for emergency response personnel to have a general appreciation of the consequences of a nuclear accident; a technical background and intimate knowledge of detailed accident sequences, however, are not necessary. Tr. 3761, 3846-47, 3886-87, 2883, 2908.

Appendix E, § IV.F, to 10 CFR Part 50, in fact, requires an applicant's emergency plans to include a radiological orientation training program for offsite emergency workers, such as civil defense and law enforcement personnel. See also NUREG-0654, supra, at 75-77. Moreover, as the Board noted and Mr. Grimes testified, NUREG-0654 is consequence-oriented, in that it is designed to provide a framework for response to a wide range of accidents. Tr. 2277, 2360-61, 3765, 3848-50. This document also requires both onsite and offsite emergency personnel to participate in accident assessment and monitoring functions, which

necessarily require some familiarity with accident consequences. NUREG-0654, supra, at 56-58. Finally, each of the four witnesses involved has had various radiological training courses or other background that would provide general familiarity with the consequences of a nuclear accident. See Resume of Robert G. Azzarello, fol. Tr. 2218; Testimony of Bertram Paul Madere, fol. Tr. 2243, at 2; Testimony of John M. Lucas, fol. Tr. 2246, at 2; Testimony of Robert William Myers, fol. Tr. 2258, at 2. In these circumstances, we cannot say that Joint Intervenors were prejudiced by the Board's ruling and, indeed, they have made no attempt to demonstrate any such harm.

3. Joint Intervenors object to the Licensing Board's denial of cross-examination on the present command structure. In particular, they sought to determine whether two individuals in important offsite emergency planning positions have conflicts of interest arising from family and financial relationships.³⁶ According to Joint Intervenors, such conflicts have a bearing on whether "adequate protective measures . . . will be taken in the

³⁶ Joint Intervenors allege that the president of St. Charles Parish "has both familial and financial interest in the well-being of . . . Louisiana Power & Light," and that Mr. Madere (Civil Defense Director of St. John the Baptist Parish) is an employee of DuPont, which has a financial interest in the Savannah River Nuclear Plant. Joint Intervenors' Br. at 41-42.

event of a radiological emergency" (10 CFR § 50.47(a)(1)).
 Joint Intervenors' Br. at 41-42.

The Licensing Board properly denied this line of questioning.³⁷ The Board concluded that inquiry about the incumbents in state and local offices with emergency planning responsibilities was beyond the scope of the contention. See Tr. 2962-66. As pertinent, contention 17/26(1)(d) stated that "there is not an adequate command decision structure, including appropriate guidance, for commencing evacuation." Construing this wording as favorably as possible to Joint Intervenors, the focus of the contention is nonetheless on the command structure, not the particular individuals with duties within that structure.³⁸ But even if incumbents were within the scope

³⁷ In point of fact, however, the Board did permit cross-examination of Mr. Madere concerning his employment with DuPont. Tr. 2234-35. Thus, Joint Intervenors cannot be heard to complain that they were prevented from pursuing this matter with witness Madere.

³⁸ Joint Intervenors point out that a staff witness testified that key individuals in the applicant's onsite planning program would be evaluated (see Tr. 3916-20), and imply that this reflects an inconsistency in approach. Joint Intervenors' Br. at 42. On the contrary, it is a manifestation of the fact that the NRC has ongoing regulatory responsibilities vis-a-vis a licensee's activities that do not exist with respect to state and local emergency planning officials, who are elected or appointed through the political process.

of the contention, Joint Intervenors have failed to explain (to us as well as to the Licensing Board) exactly how the alleged conflicts of interest would impair evacuation within the plume EPZ in the event of a serious nuclear accident. See Tr. 2963-66; App. Tr. 41-47.³⁹ In the absence of such an offer of proof, the Board was amply justified in refusing permission to cross-examine on this matter. See p. 30, supra.

4. According to Joint Intervenors, the Board prevented them from cross-examining a witness (Mr. Myers) on the adequacy of the telephone system in time of a nuclear crisis, on the ground that this was not relevant to contention 17/20(1)(c). Joint Intervenors' Br. at 42. See Tr. 2820. They contend that "the adequacy of the phone system is clearly linked to the evacuation warning system,"

³⁹ Counsel for Joint Intervenors stated that the "pretty heavy decision . . . to evacuate . . . could affect the financial interest of the utility company." Tr. 2964-65. Counsel did not elaborate, so we are uncertain as to his point. We note, however, that although the final judgment on protective action (i.e., evacuation or lesser measures) is made by the parish presidents, numerous other state officials (including the Governor) have significant input into such decisions. See Applicant's Testimony of Robert G. Azzarello, et al., fol. Tr. 2218, at 12-17. In these circumstances, it is quite unlikely that an elected official like a parish president would forgo the evacuation recommendations of other knowledgeable sources because of the uncertain effect evacuation might have on the utility's financial condition.

which contention 17/26(1)(c) addresses. Joint Intervenors' Br. at 42.

We note at the outset a discrepancy in Joint Intervenors' argument. At the hearing, they asserted that the adequacy of the phone system relates to parts (a) and (d) of contention 17/26(1), which concern, respectively, notifying residents of evacuation procedures and the command decision structure. Tr. 2819-20. Hence, their argument about part (c) appears to be raised for the first time on appeal and could be dismissed summarily on that basis. Hartsville, supra note 30, 7 NRC at 348. It also appears that, despite the Licensing Board's ruling (Tr. 2820), Joint Intervenors asked the witness essentially the same question again, he answered, and one of the Board members pursued it himself, with no further attempts by Joint Intervenors' counsel to press this line of questioning. Tr. 2820-21. Thus, they have no legitimate complaint on appeal. Nevertheless, because we believe some clarification of the record is in order, we address the merits of Joint Intervenors' argument as it relates to contention 17/26(1), parts (a), (c), and (d).

As to part (a), notification of evacuation procedures, the Licensing Board recently dealt with that matter in a separate partial initial decision. See note 1, supra. During the hearing, however, the Board ruled that the adequacy of the telephone system is not relevant to part

(a). We agree. Contention 17/26(1)(a) concerns primarily the dissemination -- in written form, not by telephone -- of evacuation information well in advance of an emergency. See Applicant's Testimony of Robert G. Azzarello, et al., fol. Tr. 2218, at 6-9; Testimony of Robert William Myers, fol. Tr. 2258, at 4-5.

Contrary to applicant's statements on brief (at 82 & n.50), the evacuation warning system at issue in contention 17/26(1)(c) does rely to some extent on the telephone system to notify persons working in major industries. See Applicant's Testimony of Robert G. Azzarello, et al., fol. Tr. 2218, at 11; Applicant's Supplemental Testimony of Ronald J. Perry, fol. Tr. 2262, at 11-12; Applicant's Exh. 8 at 1-2; LBP-82-100, supra, 16 NRC at __, __ (slip opinion at 17, 43). Mr. Myers testified, however, that, if commercial phone lines are overloaded (as in an emergency), the telephone company will assign emergency operations centers priority and cut off other users. Tr. 2820-21.

The command structure (contention 17/26(1)(d)), as well, relies somewhat on the telephone system. But it is an "operational hotline," providing continuous communication during an emergency between the utility and involved state and local agencies. As such, it is a dedicated system with radio as a backup. See Testimony of Robert William Myers, fol. Tr. 2258, at 7-8; Applicant's Testimony of Robert G. Azzarello, et al., fol. Tr. 2218, at 15; NRC Staff Testimony

of Donald J. Perrotti, fol. Tr. 3229, at 13; Tr. 2800, 2802, 3008-13; LBP-82-100, supra, 16 NRC at __, __, __ (slip opinion at 18, 47, 48-49).⁴⁰

Thus, to some extent the Licensing Board erred in finding Joint Intervenors' concerns about the adequacy of the telephone system not relevant to the issues under litigation. But assuming *arguendo* that Joint Intervenors have preserved this as a legitimate point on appeal, the record demonstrates that the phone system is adequate and that the error is harmless. See pp. 30-31, supra.

5. Joint Intervenors complain that the Licensing Board improperly ended their "potentially fruitful line of questioning" on the relationship between hysteria and the "evacuation shadow phenomenon." Joint Intervenors' Br. at

⁴⁰ Commercial telephone apparently will also serve as a backup to the hotline. Applicant's Exh. 8 at 1. But as noted above, in an emergency the telephone company will give priority to the involved emergency response organizations. Tr. 2820-21.

43. See Tr. 2918-20.⁴¹ The overall record shows otherwise.

The isolated ruling to which Joint Intervenors object must be put in context. Earlier they asked Messrs. Madere and Lucas if they were familiar with the evacuation shadow phenomenon and the witnesses answered "no." Tr. 2798. The next day Joint Intervenors' counsel asked a panel of two FEMA witnesses, John W. Benton and Albert L. Lookabaugh, if they had considered the possibility of hysteria occurring during an evacuation. The Board overruled several objections to the question and directed Mr. Benton to respond -- which he did, in the negative. Tr. 2886-92. The Board itself subsequently pursued the matter. Mr. Benton testified that he personally had not considered hysteria in evaluating the Waterford evacuation plans. He pointed out, however, that it is implicitly taken into account insofar as NUREG-0654 (the joint NRC/FEMA document relied on as guidance) covers the full range of accident sequences,

⁴¹ In referring to this matter, the Licensing Board notes that, while most of the witnesses (and parties) spoke of "hysteria," "fears," and "panic," it preferred the term "anxiety." LBP-82-100, supra, 16 NRC at ___ n.14 (slip opinion at 14 n.14).

"Evacuation shadow phenomenon" -- also characterized as "spontaneous evacuation" -- happens when there is "an evacuation by portions of the public that occurs when they have not been directed to evacuate." Tr. 3837-38.

including a "worst case" public response. Tr. 2913-15. See NUREG-0654, supra, at 6-7.

At this point, Joint Intervenors' counsel asked the panel several questions about hysteria, received little additional information, and then posed the question at issue on appeal, concerning hysteria and the evacuation shadow phenomenon. This time the Board sustained several objections, essentially on the grounds that no relationship between the two concepts had been demonstrated and that this inquiry had nothing to do with the FEMA panel's direct testimony. Tr. 2917-20. Nevertheless, a short time later the Board advised staff counsel that staff witness Mr. Grimes should be prepared to address in his upcoming testimony five Board questions, all relating to the hysteria issue. Tr. 3014-17.⁴² Mr. Grimes subsequently testified extensively on the questions posed by the Board and was cross-examined by Joint Intervenors on, among other things, hysteria and the evacuation shadow phenomenon. Tr. 3794-3820, 3828-39, 3844-46.

Joint Intervenors' argument that the Board ended a potentially fruitful line of questioning thus is without

⁴² The Board later clarified an earlier ruling (at Tr. 2890) to indicate it regarded hysteria to be relevant to only contention 17/26(1)(b), which involves the adequacy of roads and highways for evacuation, and it modified its questions accordingly. Tr. 3274-75.

merit.⁴³ The matter was pursued, at length, with the witness who appeared to be the most knowledgeable on that subject.

B. Reliance on Predictive Findings and Post-Hearing Verification

In another claim of essentially procedural error, Joint Intervenors contend that the Licensing Board's reliance on "predictive" findings and "post-hearing verification" has

⁴³ Joint Intervenors do not take issue with the Board's findings and conclusion that, "although there will be some hysteria and spontaneous evacuation, these reactions will not interfere with the evacuation scheme." LBP-82-100, supra, 16 NRC at ___ (slip opinion at 15). See also id. at ___ (slip opinion at 40). The record bears this out.

Mr. Grimes, who co-chaired the NRC/FEMA committee that drafted NUREG-0654, confirmed that the complications arising from public hysteria after an accident were taken into account, though without express mention, in NUREG-0654. Tr. 3794-95. He also noted other documents that referred to the related area of public perception of risk. Tr. 3795-96, 3798-3800. See, e.g., NUREG-0396, supra, at Appendix I; 45 Fed. Reg. at 55403 (Commission statement of consideration for final emergency planning rules). Mr. Grimes added further that the evacuation time estimates were based on models that assume the roads and highways are loaded with people all leaving at the same time. Tr. 3802-03, 3844-45.

According to Mr. Grimes, following the guidance in NUREG-0654 will minimize the possibility that people will panic in an emergency. Tr. 3805-06, 3811. In other words, the establishment of a coherent decisionmaking structure and a good public education and information program will help to assure an orderly response to an emergency. Tr. 3796-97, 3801-02, 3806-07, 3818-19. In Mr. Grimes' words, "One cannot rule out spontaneous evacuation, but we believe that the more competence that is gained in emergency plans, the less likely that sort of thing would be." Tr. 3803.

deprived them of their right to a hearing on five contested and litigable issues. Specifically, those issues (and the contentions to which Joint Intervenors allege they relate) are: (1) installation and testing of the siren warning system (17/26(1)(c)); (2) agreements with surrounding parishes for buses, ambulances, drivers, and vans (17/26(1)(f)(i-v)); (3) installation of communication systems between onsite and offsite authorities (17/26(1)(c)); (4) all implementing procedures (17/26(1)(f)(i-vi)); and (5) full testing of evacuation procedures with grading (17/26(1)(a)-(f)). Joint Intervenors argue that these matters involve material issues of fact, the resolution of which may not be delegated by the Board to the staff. Joint Intervenors' Br. at 39-41.

We are in agreement with the basic principles upon which Joint Intervenors rely. The Commission, in fact, has long held that, "[a]s a general proposition, issues should be dealt with in the hearings and not left over for later (and possibly more informal) resolution." Consolidated Edison Co. of New York (Indian Point Station, Unit No. 2), CLI-74-23, 7 AEC 947, 951 (1974). "[T]he 'post-hearing' approach should be employed sparingly and only in clear cases" -- for example, where "minor procedural deficiencies" are involved. Id. at 952, 951 n.8. Accord, Marble Hill, supra, 7 NRC at 318; Cleveland Electric Illuminating Co. (Perry Nuclear Power Plant, Units 1 and 2), ALAB-298, 2 NRC

730, 736-37 (1975); Washington Public Power Supply System (Hanford No. 2 Nuclear Power Plant), ALAB-113, 6 AEC 251, 252 (1973).

With respect to emergency planning, however, the Commission takes a slightly different course. At one time, the agency's regulations required a finding that "the state of onsite and offsite emergency preparedness provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." 10 CFR § 50.47(a)(1) (1982) (emphasis added). In July 1982, the Commission amended this provision by clarifying that "the findings on emergency planning required prior to license issuance are predictive in nature" and by eliminating the reference to the "state" of emergency preparedness. 47 Fed. Reg. 30232, 30235 (July 13, 1982), petition for review pending sub nom. Union of Concerned Scientists v. Nuclear Regulatory Commission, No. 82-2053 (D.C. Cir. filed Sept. 10, 1982). The notice of proposed rulemaking that preceded this amendment expressed the Commission's intent that "full-scale emergency preparedness exercises [be] part of the operational inspection process and [be] required prior to operation above 5% of rated power but not for a Licensing Board, Appeal Board or Commission licensing decision." 46 Fed. Reg. 61134 (Dec. 15, 1981) (emphasis added). See also 47 Fed. Reg. at 30232. The Commission emphasized, however, that "there should be

reasonable assurance prior to license issuance that there are no barriers to emergency planning implementation or to a satisfactory state of emergency preparedness that cannot feasibly be removed." 46 Fed. Reg. at 61135. Thus, while the plan need not be "final," it must be sufficiently developed to permit the board to make its "reasonable assurance" finding in a manner nonetheless consistent with the guidance of Indian Point, supra, and its progeny. See Zimmer, supra note 24, 17 NRC at __, __ (slip opinion at 15, 22); Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), ALAB-717, 17 NRC __, __ n.57 (Mar. 4, 1983) (slip opinion at 66 n.57).

To the extent that Joint Intervenors complain that the regulations are "so ambiguous as to allow licensing boards to remove litigable contentions" (Joint Intervenors' Br. at 40), their argument constitutes a challenge to the

regulations themselves, prohibited by 10 CFR § 2.758.⁴⁴ Insofar as Joint Intervenors assert that, in each of the five areas specified, the Licensing Board delegated decisionmaking authority to the staff beyond that permitted by Commission rule or case law, we reject their claims, as discussed below.

1. Installation and testing of the siren warning system. The Board stated that implementation of the system was not yet complete but that this did not constitute an infirmity in the plan. Noting the predictive nature of its findings in this area and the requirement that the plans be completed and fully "exercised" before authorization of full power operation,⁴⁵ the Board was able to find that "the

⁴⁴ This rule provides that, unless the Commission has granted a waiver, NRC regulations "shall not be subject to attack by way of discovery, proof, argument, or other means in any adjudicatory proceeding involving initial licensing."

It is noteworthy that when the Commission adopted its latest amendments to the emergency planning regulations, it explicitly addressed arguments that the rule changes would impair public participation in this important area. See 47 Fed. Reg. at 30233-34 (especially "Issues 3, 5, and 10"). The Commission stressed, in response, its intent not to issue any full-power license if a full-scale exercise raises "serious and significant deficiencies which have not been compensated for and which go to the fundamental nature of the emergency plan itself." Id. at 30234. See Tr. 3919.

⁴⁵ FEMA withholds final approval of the warning system until it is installed, tested, and evaluated, and the staff verifies compliance with the regulations. FEMA Testimony, fol. Tr. 2864, at 7; NRC Staff Testimony of Donald J. Perrotti, fol. Tr. 3229, at 10-11.

plans are sufficiently detailed and concrete to provide us with reasonable assurances that they can and will be implemented in the event of an emergency." LBP-82-100, supra, 16 NRC at ___ (slip opinion at 16-17). See id. at ___ (slip opinion at 43-44). We agree with the Board that these details "can properly be overseen by the Staff." Id. at ___ (slip opinion at 17). In our view, installation and testing of the siren system is precisely the type of matter for which the Commission believes predictive findings can suffice at this stage. Joint Intervenor^s make no challenge to the adequacy of the warning system itself or to the staff and FEMA review process. Further, there is no reason on this record to assume that the system will not function as proposed. If serious deficiencies in this part of the plan are revealed by the pre-full power exercise, the Commission will have to defer full power license issuance until the problems are cured. See 47 Fed. Reg. at 30234. See also Tr. 3919.⁴⁶

⁴⁶ In Zimmer, supra note 24, the Licensing Board found and this Board affirmed that the adequacy of applicant's communication system had not been demonstrated and thus neither Board was willing to leave the matter to post-hearing staff verification. Applicant proposed an alternative system but, because it was not incorporated in the emergency plan, the Boards could not make even a predictive reasonable assurance finding. 17 NRC at ___, ___ (slip opinion at 17-19, 22-23). By contrast, in the case before us, the siren warning system is fully described in the emergency plan and, as noted in text, has not been

2. Agreements with surrounding parishes for buses, ambulances, drivers, and vans. The Licensing Board found that, while the Parish emergency plans address the special needs of the six categories of people described in contention 17/26(1)(f), "the Parishes lack sufficient resources to implement the plan." LBP-82-100, supra, 16 NRC at ___ (slip opinion at 21). Neighboring parishes have the required number of vehicles, but letters of agreement with these entities, ensuring that vehicles and drivers will be provided if necessary, are not yet finalized. Thus, the Board formally conditioned the issuance of an operating license for the Waterford facility upon completion and submission to the staff of such letters of agreement. Id. at __, __ - __, __ (slip opinion at 21-22, 53-55, 71), as modified, LBP-82-112, supra, 16 NRC __.⁴⁷

The Board characterized this matter as involving "only a purely objective determination . . . appropriate for post-hearing ministerial resolution by the Staff." See id.

⁴⁶ (FOOTNOTE CONTINUED FROM PREVIOUS PAGE)
 challenged. See also Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), ALAB-729, 17 NRC ____, ____, (May 26, 1983) (slip opinion at 160-61) (monitoring by staff of pressurizer heaters).

⁴⁷ The Board imposed other license conditions designed to enhance the evacuation of the special groups of people identified in contention 17/26(1)(f). See LBP-82-100, supra, 16 NRC at __, __ (slip opinion at 22-23, 71). See also note 28, supra. None of these is addressed by Joint Intervenors' appeal.

at ___ (slip opinion at 23). But, in fact, there is nothing for the staff to resolve. Joint Intervenors do not dispute that the record establishes the number of each type of vehicle needed and the fact that the surrounding parishes have the ability to provide these vehicles. Negotiations for support from these parishes are already under way. Tr. 2507-09, 2522. All that is needed are the formal agreements, and the license condition imposed by the Board assures that no license will issue until the agreements are executed. In these circumstances, we find no merit to Joint Intervenors' claim. See Tr. 2517.⁴⁸

3. Installation of communication systems between onsite and offsite authorities. It is not clear what Joint Intervenors are referring to by this particular point. They cite to contention 17/26(1)(c), but that pertains to the system for warning the public to evacuate. We therefore assume Joint Intervenors meant to cite to part (d) of the contention (command structure), the only part that has any relevance to communication between onsite and offsite emergency officials.

⁴⁸ Again, Zimmer is distinguishable. The applicant in that case failed to establish even the availability of buses and drivers to evacuate certain schools. The imposition of a license condition could not have remedied this deficiency in the record. Thus, further hearing to explore this and related issues was found necessary. Zimmer, supra note 24, 17 NRC at ___ - ___ (slip opinion at 19-23).

Again, because of their failure to elaborate, we must assume that Joint Intervenors are concerned about several deficiencies in applicant's Emergency Support Organization identified by the staff. As pertinent, the staff determined that it needed more information about distinguishing between the primary and backup means of emergency communication, and a description of the "offsite emergency notification system" (including a diagram showing the relationships among the various response organizations). NRC Staff Testimony of Donald J. Perrotti, fol. Tr. 3229, at 13-14. Applicant has committed to providing this additional clarifying information to the staff for its review. Applicant's Exh. 8; Tr. 2269. In any event, the staff stated that it does not regard these deficiencies in the plan as significant, and the Licensing Board concurred. See Tr. 3894-3901; LBP-82-100, supra, 16 NRC at __, __, __ (slip opinion at 19-20, 47, 49-50).

We agree that overseeing the clarification of these minor details in applicant's plan is a proper subject for post-hearing resolution by the staff. This is particularly so in the circumstances of this case, where Joint Intervenors had the opportunity to explore this further at hearing, but failed to do so. See Tr. 3862-68, 3872, 3877-78, 3883-87, 3889-90.

4. All implementing procedures. Joint Intervenors apparently object to the fact that, at the time of the

hearing, the "implementing procedures" for applicant's emergency plan were not yet in final form and were not made part of the record. As explained by Mr. Madere (Tr. 2585, 2591):

The implementing procedures are really not part of the plan. It tells you how you're going to go about doing it. It's the type of interagency procedures.

* * *

[They are p]robably never finalized because they're always undergoing changes. Telephone numbers are added; fire trucks are added and deleted. Radios are added and deleted. This is a resource list. This is a how-to and what-to-do list. This is a list of mapping requirements, hotline procedures, notification, message flow, diagrams, et cetera.

In other words, the implementing procedures supplement the plans with all the details that will be necessary in the event of an actual emergency.

To be sure, this is important information that the utility must submit to the appropriate NRC Regional Administrator "[n]o less than 180 days prior to the scheduled issuance of an operating license." 10 CFR Part 50, Appendix E, § V.⁴⁹ The timing of this submission, however, convinces us that the Commission never intended the implementing procedures to be required for the "reasonable assurance" finding and thus to be prepared and

⁴⁹ The same provision requires a licensee to submit any changes in implementing procedures within 30 days of such changes.

subject to scrutiny during the hearing.⁵⁰ Although there is little "administrative history" on implementing procedures,⁵¹ we believe the Commission did not want licensing hearings to become bogged down with litigation about such details. Instead, the focus should be on whether an applicant's emergency plan itself satisfies the 16 more broadly drafted standards of 10 CFR § 50.47(b). Thus, because Joint Intervenors' complaint about the nonfinality of the implementing procedures amounts to a challenge to the Commission's regulations, we must reject it. See 10 CFR § 2.758, supra note 44.

5. Full testing of evacuation procedures with grading.

Once again, we are forced to intuit the gist of Joint Intervenors' argument. Presumably, they object to the fact that actual emergency preparedness exercises are not required for an initial licensing decision, or that public participation in such exercises is not mandatory. In either case, the argument is yet another possible attack on the Commission's regulations. See 10 CFR § 2.758.

⁵⁰ We note that at the hearing in this case, the implementing procedures were available in draft form (but were not offered into evidence). Joint Intervenors' counsel, however, declined to question Mr. Madere about them. Tr. 2588-89.

⁵¹ The reference at 45 Fed. Reg. at 55405 is all we have been able to locate.

10 CFR § 50.47(a)(2) states unequivocally that "[e]mergency preparedness exercises (required by paragraph (b)(14) of this section and Appendix E, Section F of this part) are part of the operational inspection process and are not required for any initial licensing decision."⁵²

Similarly, Section IV.F.1 of Appendix E to 10 CFR Part 50 states that full-scale exercises are to test as much of the emergency plans "as is reasonably achievable without mandatory public participation." In adopting these provisions, the Commission considered that the actual exercises might reveal fundamental defects in the emergency plans. In such a case, a party's recourse is to "seek to reopen a concluded hearing or file a petition for action pursuant to 10 CFR 2.206 as appropriate." 47 Fed. Reg. at 30233. The Commission also pointed out that these rules "do not preclude public observation of and participation in the exercises themselves (to the extent consistent with the rules and policies of the Commission and the objectives of the exercise) and in the review and assessment critique meetings held after the exercise." Ibid. Thus, there are other ways in which Joint Intervenors can pursue their concerns.

⁵² They are required, however, prior to operation above five percent of rated power. 10 CFR Part 50, Appendix E, § IV.F.1.b.

C. Single Mode Evacuation

Joint Intervenors' only objection to the emergency plan itself is that it calls for "single mode evacuation" from each Parish -- i.e., movement from St. John the Baptist Parish only to the west, and movement from St. Charles Parish only to the east. According to Joint Intervenors, there are other good alternative routes that should have been considered in order to comply with NUREG-0654. Further, by their account, under the existing plans some residents would have to move closer to the plant before evacuating. Although the Licensing Board found flexibility in the parish plans, Joint Intervenors argue that the record does not support this finding. Joint Intervenors' Br. at 44-45. See LBP-82-100, supra, 16 NRC at __, __ (slip opinion at 15-16, 40-41).

Joint Intervenors' arguments are without merit. The testimony and maps in the parish plans, upon which the Board relied, show that there is flexibility as to evacuation routes. For example, Mr. Madere testified that, while the major part of the plan for St. John the Baptist Parish calls for evacuation to the west, people can be moved out to the north and northwest as well, depending on conditions such as prevailing winds. Tr. 2671. See Applicant's Exh. 3 at 342-44. Further, evacuation to the east may be an additional option when certain highways and interchanges are completed. Tr. 2672. Mr. Lucas' testimony reflects a

similar flexibility in the St. Charles Parish plans; prevailing conditions will largely determine the judgment of his organization on how an evacuation is to proceed. Tr. 2796. See Applicant's Exh. 3 at 179-82. The Licensing Board thus did not "[create] a record where none existed," as Joint Intervenors charge. Joint Intervenors' Br. at 44.

Furthermore, there is nothing in the Commission's emergency planning regulations or in the guidance provided by NUREG-0654 that requires any particular "evacuation route capacity." NRC Staff Testimony of Donald J. Perrotti, fol. Tr. 3229, at 7-8. See NUREG-0654, supra, at 61, 63. NUREG-0654 is written in general terms and provides only that "[t]he entire road network shall be used but local routes shall be carefully selected and analyzed to minimize their impact on the major routes should queuing or cross traffic conflicts occur." Id., Appendix 4 at 4-5. The testimony of Messrs. Madere and Lucas that their basic plans call for evacuation in opposite directions in order to avoid confusion and minimize traffic problems is fully consistent with this guidance. See Tr. 2673, 2795.

D. Classification of the "Four Omissions"

The final argument we address is Joint Intervenors' complaint that the Licensing Board improperly "classified" what they term "four omissions." Joint Intervenors' Proposed Findings of Fact and Conclusions of Law (June 19, 1982) stated that the time estimates for evacuation were

deficient in failing to consider (1) the refusal of some people to evacuate, (2) additional collisions, (3) hysteria, and (4) the drawbacks of single mode evacuation. Joint Intervenors assert that they "categorized" these four omissions under contention 17/26(1)(f) "because they deal with unforeseen drains on resources and poor evacuation routing which affects [people who are (i) without vehicles, (ii) school children, (iii) aged or crippled, (iv) sick and hospitalized, (v) imprisoned, and (vi) transient workers] greater than the general population." Joint Intervenors' Br. at 34. By addressing the four omissions in its discussion of contention 17/26(1)(b) -- which involves the adequacy of roads and highways -- the Licensing Board "has relegated the strongest arguments of the Joint Intervenors into the weakest category." Ibid. See LBP-82-100, supra, 16 NRC at __ n.13 (slip opinion at 13 n.13).

Joint Intervenors' argument is frivolous. The important consideration is whether the Licensing Board addressed all of the parties' relevant arguments, not where in the opinion it addressed them. Significantly, Joint Intervenors do not claim that the Board ignored their arguments on either the four omissions or part (f) of contention 17/26(1). Nor could they. The Board, in fact, fully considered these points, as raised by Joint Intervenors in their proposed findings. Compare Joint Intervenors' Proposed Findings, supra, at 9-15, 20-22,

with LBP-82-100, supra, 16 NRC at ___ - __, ___ - __, ___ - __, ___ - __ (slip opinion at 13-16, 21-23, 39-41, 52-57).⁵³

From a substantive standpoint, the rubric under which the Board's discussion falls is of no moment.⁵⁴

III.

DECAY HEAT REMOVAL

The last matter to which we devote our attention is shutdown decay heat removal, identified in Staff Exh. 2, "Safety Evaluation Report" (SER), as an "unresolved generic safety issue."⁵⁵ This was not a contested issue at the hearing. The Licensing Board, however, reviewed the staff's treatment of decay heat removal pursuant to our decision in Virginia Electric and Power Co. (North Anna Nuclear Power Station, Units 1 and 2), ALAB-491, 8 NRC 245 (1978). In

⁵³ Joint Intervenors claim that they never classified the four omissions under contention 17/26(1)(b). Yet the first time they mention the omissions is in fact under the heading of their discussion of contention 17/26(1)(b). Joint Intervenors' Proposed Findings, supra, at 5-6. The Board's characterization of the four omissions is thus understandable.

⁵⁴ Moreover, given that the Board did not find "unforeseen drains on resources and poor evacuation routing" caused by the "four omissions," the underlying premise of Joint Intervenors' claim of greater impact on the six special categories of people was not proven.

⁵⁵ For a discussion of decay heat removal, see generally TMI-1 Restart, supra note 46, 17 NRC at ___ - __ (slip opinion at 21-25).

that case, we discussed a board's obligation in an operating license proceeding to search the record (especially the SER) to determine whether the staff has dealt "appropriately" with the unresolved generic issues, even where they are not contested. Id. at 247-49.

The Licensing Board here was not particularly satisfied with the staff's evaluation of how the Waterford 3 facility would handle the decay heat removal problem. Initially, the Board considered the SER. There the staff concluded -- apparently on the basis of the reliability of the auxiliary (emergency) feedwater system and, alternatively, the "feed and bleed" process -- that the plant could be safely operated before ultimate resolution of this issue. See Staff Exh. 2, SER, at C-16 - C-17. The Board correctly noted, however, that the feed and bleed option is not possible at Waterford; without pumps capable of injecting core cooling water at the safety valve pressure, this method of decay heat removal requires the release of reactor coolant through power-operated relief valves (PORVs), which are not included in the Combustion Engineering (CE) design of Waterford 3. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 5-6). The Board received additional comments from both the staff and applicant on the asserted adequacy of the emergency feedwater system to remove decay heat, but remained "personally skeptical." Id. at ___ (slip opinion

at 10).⁵⁶ Nonetheless, believing it was barred from pursuing this matter further by our opinion in North Anna, ALAB-491, supra, and the Commission's decision in Cincinnati Gas and Electric Co. (Wm. H. Zimmer Nuclear Power Station, Unit No. 1), CLI-82-20, 16 NRC 109 (1982), as clarified, CLI-83-4, 17 NRC ___ (Feb. 18, 1983), the Board accepted the staff's evaluation "with great reluctance." In addition, it urged the assessment of the reliability of the Waterford 3 decay heat removal system by an independent laboratory. LBP-82-100, supra, 16 NRC at ___ (slip opinion at 10).

This matter has not been raised on appeal.⁵⁷ But pursuant to our long standing practice, we review the entirety of licensing board decisions on significant safety and environmental issues. See Offshore Power Systems (Manufacturing License for Floating Nuclear Power Plants),

⁵⁶ The Board referred to the concern of the NRC's Advisory Committee on Reactor Safeguards (ACRS) about decay heat removal in CE plants and the ACRS' suggestion that the addition of PORVs to such plants be considered. The Board also noted, however, that the ACRS has not recommended licensing conditions for interim operation. LBP-82-100, supra, 16 NRC at ___ & n.4, ___ (slip opinion at 6 & n.4, 9).

⁵⁷ Joint Intervenors did file several exceptions directed to the Board's treatment of decay heat removal, but did not address the matter on brief. Assuming *arguendo* that Joint Intervenors could have legitimately raised this on appeal (cf. Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-728, 17 NRC ___, ___ (May 18, 1983) (slip opinion at 50-51)), they have waived the issue through their failure to brief it. See note 2, supra.

ALAB-689, 16 NRC __, __ (Sept. 1, 1982) (slip opinion at 4-6). Thus, because we are concerned that the Licensing Board's reading of our North Anna opinion may be too restrictive, we take this opportunity to clarify what we held there.

In a footnote in North Anna, we stated:

We wish to say precisely what we have and have not done. In view of the limitations imposed by regulation, and the fact that our review was necessarily unaided by any of the parties, we have not probed deeply into the substance of the reasons put forth by the staff for allowing operation to go forward. Rather, we have only looked to see whether the generic safety issues have been taken into account in a manner that is at least plausible and that, if proven to be of substance, would be adequate to justify operation. Scrutiny of the substance of particular explanations will have to await a contested proceeding.

8 NRC at 248 n.7. According to the Licensing Board, this language prevents it from exploring the decay heat removal question in greater depth. But, in our view, no such meaning is implied or intended. The excerpted passage from North Anna merely acknowledges the inherent limitations on a board's review of a matter not in contest and therefore not subject to the more intense scrutiny afforded by the adversarial process. It does not override a licensing board's authority under 10 CFR § 2.760a to raise and decide, sua sponte, "a serious safety, environmental, or common defense and security matter." Thus, if a board determines that such a serious issue exists, it may invoke 10 CFR

§ 2.760a and explore it further. Indeed, that is precisely what we did, pursuant to comparable appeal board authority under 10 CFR § 2.785(b)(2), in that same North Anna proceeding when we were dissatisfied with the staff's treatment of another unresolved generic safety issue (turbine missiles). See ALAB-529, 9 NRC 153 (1979); ALAB-676, 15 NRC 1117 (1982).

Nor do we read the Commission's decision in Zimmer, CLI-82-20, supra, as erecting an insurmountable barrier to invocation of a licensing board's sua sponte authority under 10 CFR § 2.760a. In that case, the Commission directed the Licensing Board to dismiss certain contentions the Board sought to admit as Board issues pursuant to Section 2.760a. The Commission took this action because it had already initiated a separate investigation into the same issues. In our view, the Commission did not tacitly or otherwise repeal 10 CFR § 2.760a, especially insofar as other cases are concerned.⁵⁸

⁵⁸ In 1981 the Commission did, however, instruct the boards to advise the General Counsel and the Commission of any future determinations to invoke the sua sponte authority of 10 CFR § 2.760a. See Houston Lighting and Power Co. (South Texas Project, Units 1 and 2), LBP-81-54, 14 NRC 918, 922-23 & n.4 (1981). This affords the Commission an early opportunity, on a case by case basis (as in Zimmer), to relieve the boards of any obligation to pursue uncontested issues.

Thus, if the Licensing Board here was genuinely concerned that shutdown decay heat removal presents a "serious safety" issue, it could -- and should -- have invoked its sua sponte powers under 10 CFR § 2.760a. Ordinarily we would remand the case to the Board so that it could decide if that, in fact, is the appropriate course for it to take. But as discussed below, circumstances have changed somewhat since the issuance of the Licensing Board's partial initial decision, making remand unnecessary.

Lest there be any doubt, while we disagree with the Board's reading and application of North Anna, we share its concern that the problem of decay heat removal has not been adequately addressed by the staff. The one-page discussion in the original SER consists of generalized boilerplate language applicable to many pressurized water reactors -- except, of course, for the part on the feed and bleed process, which does not apply to Waterford 3. See Staff Exh. 2, SER, at C-16 - C-17. It falls far short of the type of information about unresolved generic safety issues that we have suggested should appear in an SER. See North Anna, ALAB-491, supra, 8 NRC at 249; Gulf States Utilities Co. (River Bend Station, Units 1 and 2), ALAB-444, 6 NRC 760, 775 (1977). The staff's additional submissions to the Licensing Board (see, e.g., Staff Exh. 9) were more specific but, understandably, did not engender much more confidence in the staff's position on the part of the Board.

Unfortunately, the staff's more recent filings with us concerning decay heat removal do not show marked improvement. At oral argument in this case, we called to staff counsel's attention an April 6, 1983, memorandum from the Commission's Secretary to the Executive Director for Operations. App. Tr. 101. This memorandum reflects an apparent change in the staff position on the need for feed and bleed capability in CE plants. It states that, on April 4, "[t]he staff briefed the Commission on decay heat removal systems in CE plants and recommended that PORVs be required on such plants." It also notes the Commission's request that the staff accelerate its study of backfitting PORVs into already constructed plants and solicit and address the views of the ACRS on this matter. In response to our inquiries, staff counsel indicated that a board notification "with appropriate discussion" would be sent to us "immediately." App. Tr. 103, 102. Approximately one month later (and six weeks after the April 4 briefing) we received Board Notification BN-83-63 (May 18, 1983) -- a document that is wholly inadequate, both as to content and timeliness.

BN-83-63 consists of a one-page cover memorandum; a five-page service list; another, briefer memorandum from one staff director to another (dated 24 days after the Commission briefing), requesting (nine days after we requested it at oral argument) preparation of a board

notification; the April 6 memorandum from the Secretary (to which we referred at oral argument); and a one-page memorandum to the Secretary repeating the salient points of the April 6 memorandum and adding that the staff will conclude its "investigation" by June 30, 1983, and present its recommendations to the Commission in August-September 1983. This Board Notification told us what we already knew and provided little else. It is noteworthy more for what it does not say than for what it says. For example, we expected at least a summary of the staff's April 4 briefing of the Commission, with a statement of the staff's current position on the need for PORVs in CE plants generally. But, more importantly, we hoped to learn how the staff's current views affect the position it took before the Licensing Board on decay heat removal at Waterford 3. In each instance, our expectations have gone unfulfilled. BN-83-63 is virtually useless due to its failure to meet the minimal criteria for board notifications.⁵⁹

⁵⁹ In Virginia Electric and Power Co. (North Anna Nuclear Power Station, Units 1 and 2), ALAB-551, 9 NRC 704, 710 (1979), we stated that "if the notification is to serve its intended purpose a board must be supplied with an exposition adequate to allow a ready appreciation of (1) the precise nature of the addressed issue and (2) the extent to which the issue might have a bearing upon the particular facility before the board."

Consequently, we have undertaken our own review of the transcript of the April 4 Commission briefing on "Decay Heat Removal Studies on CE Plants."⁶⁰ It is still not clear to us from reading the entire transcript what the staff's position on this matter is.⁶¹ The Director of the NRC's Division of Systems Integration stated that there is a "need for PORVs to manage steam generator tube ruptures," and that "I think our bottom line technical judgment today is that we still think we should have PORVs on this [CE] design." C.Tr. 5, 9. Yet the same day as this briefing, another board notification issued by the staff suggested that, because CE plants (unlike Westinghouse and Babcock and Wilcox (B&W) facilities) have a safety-grade auxiliary pressurizer spray to provide the capability for rapid primary system depressurization to mitigate a design basis steam generator tube rupture, the backfitting of PORVs to CE plants would not be necessary. See Board Notification BN-83-47 (April 4, 1983), Enclosure at 1-2, 3. Scattered references to Westinghouse and B&W plants throughout the April 4 transcript, among other things, have added to the

⁶⁰ References to the transcript of this briefing will be "C.Tr."

⁶¹ We recognize, as well, that the transcript is "unofficial," and that the opinions expressed therein "do not necessarily reflect final determinations or beliefs." Disclaimer, fol. C.Tr. 1.

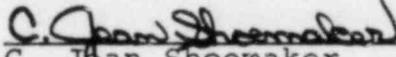
confusion. One thing, however, does seem clear. An independent laboratory (Sandia) is studying the decay heat removal problem in CE plants, and the staff expects to be able to advise the Commission by late summer of this year as to Sandia's findings and the staff's evaluation of them. See C.Tr. 81-83, 93. This is essentially the action that the Licensing Board recommended in this case. See LBP-82-100, supra, 16 NRC at ____, ____ (slip opinion at 10, 32).

In order to facilitate the fulfillment of our responsibilities on such safety matters, we would have appreciated a clearer expression of the staff's position and intention specifically with respect to the licensing of the Waterford 3 plant. Nevertheless, we do not believe that a better or faster determination of the capability of Waterford 3 to deal with decay heat removal could be obtained through further adjudicatory proceedings on this uncontested issue. We therefore leave the ultimate resolution of this matter to the staff and the Commission.

For the reasons set forth in this opinion, the Licensing Board's partial initial decision (LBP-82-100, as modified, LBP-82-112) is affirmed.

It is so ORDERED.

FOR THE APPEAL BOARD


C. Jan Shoemaker
Secretary to the
Appeal Board