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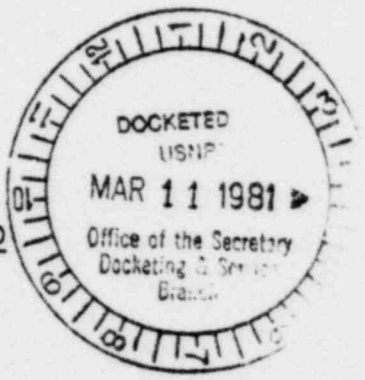
UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

LICENSEE'S MEMORANDUM OF LAW IN ASSOCIATION WITH TESTIMONY IN RESPONSE TO BOARD QUESTION NO. 6

I. Introduction

Board Question No. 6 was first identified by the Board during the prehearing conference of August 12 and 13, 1980. See Tr. 2394-2396. The Board reduced the question to writing in its Memorandum and Order of September 8, 1980 (at A-31 to A-33), and in its Memorandum on Board Questions, dated September 12, 1980. Board Question 6 is entitled, "Emergency Feedwater Reliability," and is divided into parts "a" through "k".

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In response to Board Question 6, Licensee filed and presented the following direct evidence:

1. Licensee's Testimony of Gary R. Capodanno, Louis C. Lanese and Joseph A. Torcivia in Response to Board Questions 6.a, 6.b, 6.c, 6.g, 6.h, 6.i, 6.j and 6.k, following Tr. 5642;

2. Licensee's Testimony of Robert C. Jones, Jr. in Response to Board Questions 6.e and 6.f, following Tr. 4588; and,

3. Licensee's Exhibit No. 15, "TMI-1 Emergency Feedwater System."

Part 6.d of the question was answered at page 12 of Licensee's Testimony of Robert W. Keaten and Robert C. Jones in Response to UCS Contention Nos. 1 and 2 (Natural and Forced Circulation), following Tr. 4588.

Licensee's Exhibit No. 15, which was prepared especially for this hearing to supplement the written testimony in response to Board Question No. 6, describes the TMI-1 emergency feedwater ("EFW") system as it existed prior to recent modifications, the modifications being made to the system prior to plant restart, and the long-term modifications planned for the TMI-1 EFW system. The exhibit discusses the reliability of the EFW system both before and after these modifications, and compares the system against the NRC General Design Criteria (Appendix A to 10 C.F.R. Part 50) directly applicable to the system design.

Licensee witnesses Capodanno and Lanese were examined by the Board and the parties with respect to Licensee's testimony in response to Board Question 6 and Licensee's

Exhibit 15 at the hearing sessions of November 13, 14, 18 and 19, 1980. See Tr. 5639-6025.

At the hearing session of November 5, 1980, the Board, on the basis of its review of Licensee's filed testimony, advised Licensee that its testimony on Board Question 6 did not address all of the issues the Board intended to be covered by the question. The Board clarified the issues which it intended to be addressed in Board Question No. 6 to include the following:

> How would the emergency feedwater system, if relied upon, bring the plant to cold shutdown?
>
> If emergency feedwater fails, what are the complexities and problems involved in the operation and termination of the feed and bleed cooling mode?
>
> How is an alternative cooling mode, such as restoration of emergency feedwater, initiated in order to bring the plant to cold shutdown?

See Tr. 4812, 4813.

In response to this clarification, Licensee has filed "Licensee's Supplemental Testimony of Robert W. Keaten, Joseph J. Colitz and Michael J. Ross in Response to Board Question No. 6 (Emergency Feedwater Reliability)," dated November 25, 1980. This testimony has not yet been presented at the hearing.

At the hearing session of November 20, 1980, during the examination of NRC Staff witnesses on emergency feedwater reliability and before the parties had responded to the November 5th clarification of Board Question 6, Administrative Judge Jordan stated his views on the deficiencies he perceives

in the evidentiary record on emergency feedwater reliability. In Licensee's view, the positions taken and concerns raised by Administrative Judge Jordan on November 20, 1980, go beyond the Board's November 5th clarification of Board Question 6 and, consequently, are not addressed in the supplemental (Keaten-Colitz-Ross) testimony Licensee filed on November 25, 1980.

On November 21, 1980, Chairman Smith invited the parties to schedule a time to discuss with the Board the state of the record on emergency feedwater reliability and the nature of any further evidentiary presentations which might be offered on Board Question 6, commenting that the Board had not given as much guidance as it had a demonstration of dissatisfaction. Tr. 6358. Administrative Judge Jordan commented that while he would like to hear what the parties propose to present, he had no further guidance to offer. Tr. 6359.

Following our review of the transcript of November 20, Licensee concluded that Administrative Judge Jordan's positions and concerns were adequately understood, and no subsequent dialogue with the Board was initiated by Licensee or any other party. The purpose of this memorandum, however, is to explain succinctly why Licensee believes that the evidentiary record on the reliability of the TMI-1 emergency feedwater system, with the enclosed additional testimony by Mr. Keaten, is adequate.

II. The St. Lucie Decision

The original Board Question 6 concluded as follows:

> 6.k. Question 6 should be addressed with reference to Florida Power & Light Co. (St. Lucie, Unit 2), ALAB-603, (July 30, 1980); i.e. whether loss of emergency feedwater is a design basis event notwithstanding whether design criteria are met.

It is apparent from his remarks on November 20, 1980, that Administrative Judge Jordan's concerns with emergency feedwater reliability are inspired largely by his reading of the Atomic Safety and Licensing Appeal Board's decision in Florida Power and Light Company (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB-603, 12 N.R.C. 30 (1980), review pending, CLI-80-41, 12 N.R.C. ____ (December 12, 1980). It is also apparent from those remarks that Licensee did not appreciate the import of the reference to St. Lucie in the original Board Question 6.k.

As a part of its review of licensing board decisions authorizing the issuance of a construction permit for St. Lucie-2, the Appeal Board conducted an evidentiary hearing on the adequacy of electric power systems:

> Because of Florida's peninsular shape the applicant's electrical distribution system (grid) can be connected with the grids of other utilities only to the north. This suggested -- and the applicant's operating history tended to confirm -- that FP&L's grid might be less reliable than ones interconnected with multiple grids. There was no indication, however, that the onsite emergency power system at St. Lucie had been designed to compensate for a lesser degree of grid stability and the Licensing Board had no occasion to explore the matter.

ALAB-603, supra, 12 N.R.C. at 31. Consequently, the Appeal Board sought from the parties certain information and advice as to whether further proceedings were necessary. Id. at 33.

> The substantial amount of information submitted by the parties convinced us that an evidentiary hearing was needed to explore our questions about the stability of Florida Power and Light's electrical grid and the reliability of AC power for St. Lucie Unit 2. We had several particular concerns: (a) the implications of then recent grid disturbances (including a complete loss of offsite power on May 14, 1978); (b) the staff's opinion that offsite power was less assured for St. Lucie than for nuclear plants in nonpeninsular areas, and (c) the lack of compensation for that situation in the design of the onsite power system. We therefore ordered a hearing held before us on those concerns and directed the parties to answer additional questions in preparation for it.

Id. at 34 (footnotes omitted).

The Appeal Board, on the basis of the evidence presented, found that the likelihood of the loss of all AC power at St. Lucie-2 is the product of two factors: (1) the probability of an offsite power failure (found to be between 0.1 and 1.0 per year) and (2) the probability of a simultaneous failure of both diesel generators to start on demand (found to be 10^{-4}, at best, assuming true independence of the two diesel generator systems). This yielded a combined probability in the range of 10^{-4} to 10^{-5} per year. Id. at 45.

Rejecting arguments that the assumed simultaneous failure of both diesel generators challenges the "single failure criterion," the Appeal Board found, on the basis of failure rate data presented in the Reactor Safety Study,

WASH-1400 (the Rasmussen Report), that diesel generators are relatively unreliable pieces of equipment, compared to other equipment to which the single failure criterion is commonly applied, and that "[b]lind reliance on the single failure criterion (that is, simple redundancy) does not provide an adequate degree of plant safety and public protection in this state of affairs." Id. at 48-52.

The Appeal Board compared the probability range for station blackout at St. Lucie-2 (10^{-4} to 10^{-5} per year) with certain guidelines in the NRC Staff's Standard Review Plan ("SRP") for determining whether particular accidents should be considered in designing a plant, even though the Staff testified that it had no numerical reliability goals for station blackout. The SRP, according to the Appeal Board, provides that events must be considered in the design where they have: (1) a realistically calculated probability of occurrence of at least 10^{-7} per year, or (2) a conservatively calculated probability of 10^{-6}. Accordingly, the Appeal Board found that the probability of a loss of all AC power is unacceptably high relative to accidents and other events considered incredible for design purposes. Id. at 45-46, and 52.

As the Appeal Board acknowledged, and as the Commission subsequently observed, SRP section 2.2.3, used in ALAB-603 as some sort of benchmark for assessing whether events are "design basis,"[1] deals specifically with Staff reviews of

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1 "Design bases" means that information which identifies the specific functions to be performed by a structure, (continued next page)

certain off-site hazards and the need for any protective measures. See id. at 45, n.53; CLI-80-41, supra, slip op. at 1. One of the generic issues in ALAB-603 which the Commission has set for review is the following:

> What are the generic implications of using the threshold probabilities in Section 2.2.3 of the Standard Review Plan as guidelines in determining the design basis events to be used for plant design and operation?

CLI-80-41, supra, slip op. at 3 (footnote omitted).

In a memorandum issued after CLI-80-41, supra, the Appeal Board advanced its view that the question posed above by the Commission is not presented by, and is inspired by a misconstruction of, ALAB-603. The Appeal Board stated that it was the very magnitude of the probability values, independently assessed by the Appeal Board from the evidentiary record, which served as the basis for its ultimate determination that the station blackout sequence must be considered as a design basis event. Florida Power and Light Company (St. Lucie Nuclear Power Plant, Unit 2), Appeal Board Memorandum (December 22, 1980), Docket No. 50-389.[2]

(continued)
system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted "state of the art" practices for achieving functional goals, or (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals. 10 C.F.R. § 50.2(u).

2 A copy of the Appeal Board's Memorandum is attached.

Consequently, ALAB-603 appears to have limited precedential value for other plants and other plant systems. The Appeal Board's investigation was inspired by a very unique circumstance -- operating experience which confirmed a suspicion that St. Lucie is more vulnerable to loss of off-site power than nuclear power plants in non-peninsular areas. This was compounded by a second unusual circumstance, a finding based on WASH-1400 estimates that diesel generators were sufficiently unreliable to warrant a deviation from the single failure criterion. ALAB-603 apparently does not stand for the proposition that a failure probability of 10^{-6} per year should be used generically to classify a scenario as a design basis event to be used for plant design and operation. Indeed, the NRC Staff has testified in this proceeding that SRP section 2.2.3, referred to in ALAB-603 as the criterion for acceptability of the plant design to mitigate the assumed event, was intended by the Staff to be applied only to external plant hazards such as nearby transportation of toxic gases or explosives, and not to events within the plant such as a postulated loss of emergency feedwater. NRC Staff Testimony of J. Wermeil, W. Jensen, E. Lantz, and B. Boger Regarding Emergency Feedwater System Reliability (Board Question 6), following Tr. 6035, at 10. The NRC has not yet established a numerical safety goal. Id.

III. The Record on the TMI-1 EFW System

No party has challenged the necessity or the sufficiency of the modifications to the TMI-1 EFW system

proposed in the Commission's Order and Notice of Hearing, and all of the witnesses who testified expressed the view that the system will be sufficiently reliable to support restart of the plant. The dissatisfaction Administrative Judge Jordan apparently has with the current record, however, stems from the testimony that neither Licensee[3] nor the NRC Staff[4] has a quantitative reliability goal against which the EFW system has been compared. That is still the case today.

Applying, by way of analogy, the Appeal Board's analysis in ALAB-603 of the St. Lucie electrical power system, Administrative Judge Jordan postulated, at the hearing session of November 20, 1980, that:

> 1. B&W plants are more sensitive because of the once through steam generator design and they experience an unusually high EFW challenge rate of three per year.[5] (This apparently is analogous to St. Lucie's vulnerability to loss of off-site power.[6])

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3 Tr. 5789-5798, 5948 (Capodanno).

4 Tr. 6168, 6178 (Wermeil).

5 Tr. 6150, 6175, 6179-6180.

6 Note, however, that the Appeal Board's concern at St. Lucie was inspired by evidence of actual experience at that specific plant with instabilities in off-site power supplies. Here, however, there is no evidence that TMI-1 has experienced an unusual challenge rate to its EFW system.

2. Emergency feedwater systems, on an industry-wide basis, have experienced a failure rate of 1 in 25 per reactor-year -- which is so high that reliance on safety-grade criteria should be rejected.[7] (This apparently is analogous to the Appeal Board's findings on diesel generator reliability and deviation from the single failure criterion.)

3. Consequently, it should be demonstrated that the overall reliability of the TMI-1 decay heat removal systems is such that the probability of failure is less than 10^{-6} per year.[8]

The enclosed testimony shows that Licensee has been unable to verify the postulated EFW challenge rate of three per year in B&W plants. Consequently, and for the additional reason (explained in the testimony) that EFW challenge rates are generally unrelated to the NSSS vendor, Licensee contends

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7 Tr. 6169, 6179-6180, 6182-6183. Later testimony, however, shows that from January, 1979, through August, 1980, there were no instances where the emergency (or auxiliary) feedwater system at any pressurized water reactor was incapable of performing its essential functions. Licensee's Testimony of Robert H. Koppe in Response to CLI-80-5, Issues 8 and 9 (Licensee's Infraction, LER and Operating Experience History), following Tr. 13,335, at 40. The unavailability of the TMI-1 EFW system was zero for five years of operation. Id. at 41. TMI-1 has not experienced a single loss-of-all-feedwater transient. Tr. 6175, 6176 (Wermeil).

8 Tr. 6184, 6186-6187.

that there is no special circumstance warranting a quantitative probabilistic analysis of the TMI-1 decay heat removal systems.[9]

Further, the testimony explains the limitations on industry-wide data on EFW system failures and the desirability of concentrating upon plant-specific data. It also challenges the postulated EFW failure rate of 1 in 25 per reactor-year.

Nevertheless, the record already shows, on the basis of comparative reliability studies performed by and/or at the direction of the NRC Staff, that the TMI-1 EFW system, even prior to recent modifications, had a reliability comparable to the EFW systems at Westinghouse and Combustion Engineering plants, Tr. 5984-5985 (Capodanno), Tr. 6157-6159 (Wermeil), and that Combustion Engineering and most Westinghouse plants do not have the "feed and bleed" cooling mode capability as a backup to their emergency feedwater systems. Tr. 5985 (Capodanno).

IV. Conclusion

Licensee's position is that the St. Lucie decision, ALAB-603, supra, to the extent that it has any precedential value beyond the plant specific record developed there, should not be applied to require a quantitative assessment of the probability of failure of the TMI-1 decay heat removal system

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9 Administrative Judge Jordan agreed that such an analysis would not be necessary in the absence of a special situation. Tr. 6187-6188.

because there is no evidence of special circumstances here -- either in terms of the rate of challenge to the system or in terms of the likelihood that it will fail.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

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Dated: March 9, 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

John F. Ahearne, Chairman
Victor Gilinsky
Joseph M. Hendrie
Peter A. Bradford

SERVED DEC 12 1980

In the Matter of

FLORIDA POWER AND LIGHT COMPANY

(St. Lucie Nuclear Power Plant, Unit 2)

Docket No. 50-389

MEMORANDUM AND ORDER

(CLI-80-41)

The Commission has decided to reconsider its previous determination not to review the decision of the Atomic Safety and Licensing Appeal Board in ALAB-603. Upon reconsideration, the Commission has determined to exercise its authority to review on its own motion certain implications of ALAB-603. 10 CFR 2.786(a). The reasons for this decision and the issues for review are discussed below.

I.

In ALAB-603, the Appeal Board found that the total loss of on-site and off-site AC power (station blackout) must be considered a design basis event for St. Lucie, Unit 2. This conclusion was based on calculations which showed that the probability of station blackout could exceed some threshold values in the Standard Review Plan that are used by the staff to aid in its determination as to whether or not protective measures are needed for certain off-site hazards. Consequently, s Final Safety Analysis Report must include s ability to operate through such an event, ation operation during a blackout transient

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING APPEAL BOARD

Administrative Judges:

Richard S. Salzman, Chairman
Dr. W. Reed Johnson

In the Matter of	
FLORIDA POWER AND LIGHT COMPANY	Docket No. 50-389
(St. Lucie Nuclear Power Plant, Unit 2)	

MEMORANDUM

December 22, 1980

In its order of December 12, 1980, CLI-80-41, 12 NRC ___, the Commission announced that it would review sua sponte the "generic aspects" of ALAB-603, 12 NRC 30 (1980).[1] As the order correctly notes (slip opinion at p. 1), in that decision this Board determined that the total loss of on-site and off-site AC power (i.e., station blackout) must be treated as a design basis event for Unit 2 of the St. Lucie nuclear facility. The order goes on to state that this determination had been based upon:

> calculations which showed that the probability of station blackout could exceed some threshold values in the Standard Review Plan [illegible] staff to aid in its determination whether or not protective [illegible] for certain off-site

[illegible] Commission affirmed the license [illegible] for St. Lucie Unit 2. Slip opin-

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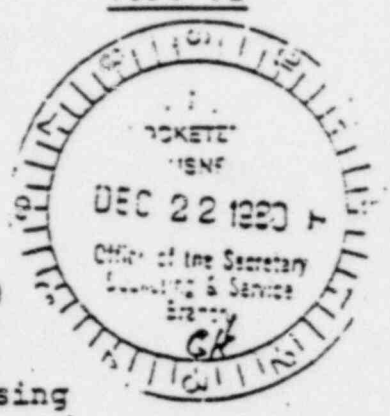

NUCLEAR REGULATORY COMMISSION
[Docket No. 50-389]

FLORIDA POWER AND LIGHT COMPANY
(ST. LUCIE NUCLEAR POWER PLANT, UNIT 2)

Reconstitution of Atomic Safety and Licensing Appeal Board

SERVED DEC 22 1980

Notice is hereby given that, in accordance with the authority conferred by 10 CFR §2.787(a), the Chairman of the Atomic Safety and Licensing Appeal Panel has assigned the following panel members to serve as the Atomic Safety and Licensing Appeal Board for this construction permit proceeding:

Richard S. Salzman, Chairman
Dr. W. Reed Johnson

C. Jean Bishop
Secretary to the
Appeal Board

Dated: December 19, 1980

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