UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	
	)	Docket No. 50-335 OLA '88 SEP 28 P4:41
FLORIDA POWER AND LIGHT COMPANY	)	
	)	ASLBP No. 88-560-01-LA
(St. Lucie Plant, Unit No. 1)	)	

INTERVENOR'S RESPONSE TO LICENSEE'S MOTION FOR SUMMARY DISPOSITION OF INTERVENOR'S CONTENTION 3

I. LEGAL STANDARDS FOR SUMMARY DISPOSITION

Under both the Commission's and Federal Court Rules of Practice, "the burden of proof lies upon the movant for summary disposition, who must demonstrate the absence of any issue of material fact." Adickes v. Kress and Co., 398, U.S. 144, 157, Perry ALAB-443, supra, 6 NRC at 753. Again under both NRC and Federal Rules, "the record is to be reviewed in the light most favorable to the party opposing the motion." Dairyland Power Cooperative, 16 NRC 512, 519(1982) citing: Poller v. Columbia Broadcasting System Inc., 368 U.S. 464, 473(1962); Crest Auto Supplies Inc. v. Ero Manufacturing Co., 360 F. 2d, 896, 899 (7th Cir. 1966); United Mineworkers of America, Dist. 22 v. Ronoco, 314 F. 2d 185, 188 (10th Cir. 1963); Pennsylvania Power & Light Co. and Allegheny Electric Co-operative Inc. (Susquehanna Steam Electric Station, Units 1 and 2) LBP 81-8, 13 NRC 335, 337 (1981); Seabrook, LBP-74-36, supra, 6 NRC, supra, 7 AEC at 879.

"Because the proponent of a motion for summary disposition has the burden of demonstrating the absence of a genuine issue of material fact, it does not necessarily follow that a motion supported by affidavits will automatically prevail over an opposition not supported by affidavits. The Board must scrutinize the motion to determine whether the movant's

burden has been met." Carolina Power & Light Company and North Carolina Eastern Municipal Power Agency (Shearson Harris Nuclear Plant, Units 1 and 2) LBP-84-7, ASLBP No. 82-468-01-OL, 19 NRC 432 (1984).

Finally, for a contention to remain litigable, the Intervenors must present to the Board a sufficient factual basis, "to require reasonable minds to inquire further." Pennsylvania Power and Light Company and Allegheny Electric Cooperative Inc., (Susquehanna Steam Electric Station Units 1 and 2) ALAB 613, 12 NRC 317, 340 (1980).

II. INTERVENOR'S CONTENTION 3

The purpose of this response is to address Intervenor's Contention 3 which states:

> Contention 3: The Licensee and Staff have not adequately considered or analyzed materials deterioration or failure in materials integrity resulting from the increased generation of heat and radioactivity as a result of increased capacity in the psent fuel pool during the period authorized by the license amendment.

1. Very little information pertaining to the performance characteristics of Boraflex has been developed from testing. In addition, much of the testing has been on small samples in non-spent fuel pool environments and therefore, the applicability of the results is highly questionable. The conclusion of the Quad Cities study was, "The results are considered preliminary since there are areas where data are not available. Accordingly, as additional data becomes available, the conclusions developed as a result of the preliminary assessment could change." (Quad Cities Spent Fuel Storage Racks, Report No. NET-042-01, dated 4/10/87, pg. 10-1)

2. Under testing, heat is suspectd as being an essential cause of gap formation. "Equation 7-5 also indicates that the elastic modulus is a function of temperature." (Quad Cities, pg. 8-4) There is very little data

available on prolonged exposure of in-service Boraflex at the temperatures that will be present in St. Lucie I spent fuel pool. The bulk pool temperature of the Quad Cities facility was only 100° F.

3. Both the Quad Cities and the Point Beach study indicate that pool chemistry must play an important role in the integrity of Boraflex. The effect of various Ph's on Boraflex is not known at this time. "At some point the pool chemistry (e.g., acidity or alkalinity) may be an important factor in influencing the rate of degradation with irradiation and exposure to the aqueous pool environment." (Quad Cities, pg. 8-9) The Quad Cities report even brings into serious question the applicability of that study to a particular, spent fuel pool environment. "Because of the difference between the test conditions and the pool environment, it is difficult to project long term integrity based on the test data." (Quad Cities, pg. 8-10)

4. Essentially stress free and non-pool testing of small, Boraflex samples has occured at doses up to 10^{12} rads in a reactor. High -level, radiation testing over short periods of time can produce dramatically different results than continuous, long-term , low dosage exposure. Therefore, the applicability of those results to the instant case is highly speculative.

5. Testing was done at the Ford Reactor at the University of Michigan to demonstrate the radiation stability of Boraflex. In evaluating the data, the Quad Cities report noted many important factors. "Accordingly, it must be noted that differences in irradiation environment exist between the test experiments and the Quad Cities spent fuel pool. There are probably differences in the gamma spectrum in the test reactor and in the Quad Cities pool." (Quad Cities, pg. 6-1) They also noted that the physical dimension data gathered from the small samples may not provide a reliable indicator of

the total extent of the Boraflex shrinkage. "The accuracy of these measurements is not known, but it is suspected that accurate dimensional measurements on small samples would be difficult." (Quad Cities, pg. 6-2)

6. The results of the Ford Reactor study were cast in a skeptical light by the Quad Cities study. "Furthermore, uncertainties may be present owing to the extrapolation of test data from small test samples to a 152" length of Boraflex." (Quad Cities, pg. 8-6) "Because of the difference between the test conditions and the pool environment, it is difficult to project long term integrity based on the test data. We have noted potential effects due to neutrons in the irradiation tests. As noted above, chemical effects may be important as well." (Quad Cities, pg. 8-10).

7. Tests were conducted on small, Boraflex samples in the Ford Reactor study. They were subject to an exposure of up 1×10^{12} rads. It is important to note that this is a measure of a cumulative exposure to both gamma and neutron radiation. In the spent fuel pool environment, the exposure would be almost exclusively to the more destructive, gamma radiation. Thus whether the polymner could endure an exposure of 1×10^{10} rads gamma is unknown.

8. Even if total, in-plane shrinkage of Boraflex was limited to 2.5%, this would produce a gap of approximately 4 inches in a standard, in-service panel. This would allow assemblies of initial enrichment of 4.5 w/o U-235 loaded into Region I to exceed a k_{eff} of 0.98.

9. Licensee's contention that Boraflex may not receive a cumulative dose that exceeds 10^{12} rads may well be true. However, that is well past the point at which degradation of the material may occur according to both the Quad Cities and Point Beach studies. "Long Before the accumulation of this dose

(10^{10} rads), the polymer will probably be severely changed and the G(XL) value will have changed.: (Quad Cities, pg. 7-6). "If, as has been discussed previously, crosslinking between adjacent chains in the polymer is responsible for the observed shrinkage, it might be reasonable to expect the rate of shrinkage to be greatest at low doses." (Quad Cities, pg. 8-8). "In the case of Boraflex exposad to PBNP conditions, it appears that Boraflex may begin to be susceptible to water permeation and subsequent changes in material integrity at about 1 x 10^{10} rads gamma." (Point Beach study, VPND-87-48, dated 11 February 1987, pg. 7). "The rate of Boraflex shrinkage is likely to be greatest at low doses when there are many sites available for crosslinking." (Quad Ci es, pg. 10-6).

10. Licensee has simple mindedly attributed all shrinkage and gap formation in Boraflex to stress created by the fabrication method of previous high density, storage racks utilizing Boraflex panels. Although the fabrication may indeed be a contributing cause to gap formation, other factors, undoubtedly, also contribute to gap formation. "The long-term stability of the dimethyl polysiloxane matrix which contains the B_4C powder in Boraflex cannot be projected at this time. The qualification program conducted by BISCO examined radiation effects and long term exposure to an aqueous environment separately. The combined effects after crosslinking saturates and scissioning predominates may likely depend on such factors as pool water chemistry, water temperature, and local flow conditions around the Boraflex panels." (quad Cities, pg. 10-6). In fact, "From the outset it should be noted that the mechanisms for gap formation and gap growth described are preliminary as the extent of data currently available is limited. As such, any conclusions

drawn from this material are preliminary and may change as more data relative to Boraflex behavior under irradiation is documented. Further experiments will probably be required to determine the causes for all effects noted." (Quad Cities, pg. 8-1). In concluding their discussion on gap formation and gap growth in Boraflex, the Quad Cities study states, "Projections of the overall service life of Boraflex in a spent fuel pool environment are not possible at this time. The results of a larger program in which data from surveillance coupons from several U.S. plants is gathered and evaluated may provide some answers." (Quad Cities, pg. 8-11).

11. The polymer which contains the Boraflex is subject to degradation under irradiation whether or not under stress.

12. All fuel in Region II is limited to a maximum enrichment after burnup of 1.5 w/o U-235. However, fuel of an inital enrichment of 4.5 w/o will after burnup, have approximately 1.75 times as many fission products as fuel of initial enrichment of 3.2 w/o, as in the Quad Cities study, and will, therefore, emit 1.75 times as much gamma radiation in the spent fuel pool. This will accelerate the time in which the Boraflex will receive an accumulated dose of 1×10^{10} rads gamma and will shorten the life of the material in-service.

13. Boraflex is comprised of a polymeric silicone encapsulant entraining and fixing fine particles of boron carbide in a homogeneous, stable matrix. The carbides are inherently stable. The silicones are clearly unstable. The Quad Cities study detailed the scissioning of the polymer and the accompanying substitution of methyl groups resulting in two, new polymers. Both different from the first. The durability of these polymers when subject to long term gamma radiation is unknown.

14. In conclusion, Intervenor contends that the Licensee has not met their burden of proof on this contention and that several issues of material fact remain on this contention. One, the polymer which contains the Boraflex degrades under irradiation. Two, degradation usually leads to formation of gaps in the Boraflex which displaces the neutron absorber. Three, this displacement attenuates the neutron absorbing ability of the Boraflex material leading to an increase in overall reactivity of the region. Four, silicons comprising the polymer are clearly unstable. The Quad Cities study revealed the scissioning of the polymer and the resulting two, new polymers, both different from the first. Five, the durability of these new polymers is unknown. Six, The acidity or alkalinity of the pool environment probably effects the integrity of the material. Seven, prolonged exposure to elevated temperatures in the aqueous environment probably effects the integrity of the Boraflex material. Eight, the projected, overall service life of Boraflex is 10^{10} rads gamma. Nine, this gamma exposure may be accelerated due to the presence of spent fuel of initial enrichment 4.5 w/o U-235. Ten, testing of small samples in a reactor does not give reliable data as it pertains to the spent fuel pool environment. Thus those results are often inadequate or misleading. Eleven, more actual, in-service experience is needed with Boraflex to confirm its integrity in a spent fuel pool environment over a projected service life of 20 years.

Respectfully submitted,

Campbell Rich