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

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT	)	Docket No. 50-400 -LA
(Shearon Harris Nuclear	)	ASLBP No. 99-762-02-LA
Power Plant)	)	
	)	

ORANGE COUNTY'S REPLY TO APPLICANT'S AND STAFF'S OPPOSITIONS TO REQUEST FOR ADMISSION OF LATE-FILED ENVIRONMENTAL CONTENTIONS

I. INTRODUCTION

As permitted by the Licensing Board's Order dated February 14, 2000, Orange County hereby replies to the Applicant's and Nuclear Regulatory Commission ("NRC") Staff's responses in opposition to Orange County's Request for Admission of Late-Filed Environmental Contentions (January 31, 2000) ("Orange County's Contentions"). *See* Applicant's Response to BCOC's Late-Filed Environmental Contentions (March 3, 2000) ("Applicant's Response"); NRC Staff's Response to Intervenor's Request for Admission of Late-Filed Environmental Contentions ("Staff's Response"). Neither the Applicant nor the Staff objects to the County's environmental contentions on grounds of lateness. However, both contend that the contentions fail to meet the Commission's admissibility criteria. As discussed below, their objections are without merit. This Reply is supported by the Reply Declaration of Dr. Gordon Thompson, which is attached as Exhibit 1.

II. SATISFACTION OF LATE-FILING CRITERIA

With respect to all but one of the County's contentions, neither the Applicant nor the Staff contests the County's satisfaction of the Commission's criteria for late-filing of

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contentions. Applicant's Response at 2, Staff's Response at 4. The Staff, however, claims that the County lacks good cause for the late filing to the extent that it is "raising a security issue related to its contention regarding sabotage." Staff's Response at 3. The Staff apparently misconstrues Contention EC-1. This contention does not raise any claim with respect to Carolina Power & Light's ("CP&L's") satisfaction of NRC safety regulations governing security at nuclear power plants. Rather, the contention seeks to raise the issue of sabotage risks as an environmental issue, in relation to the Environmental Assessment ("EA") and in the context of the National Environmental Policy Act ("NEPA"). Accordingly, the County is not unacceptably late in raising this issue.

Although it does not object to the County's overall satisfaction of the late-filing criteria, the Applicant disputes the County's claim that its participation in this proceeding can be expected to assist in the development of a sound record. Applicant's Response at 2. According to the Applicant, the County's expert, Dr. Gordon Thompson, "does not have the education, qualifications, or experience to assist the Board in the development of a sound record on the issues." *Id.*

There is no need to address this meritless argument in the context of the late-filing standard, because the neither the Applicant nor the Staff has generally objected to the lateness of the contentions. The argument must be addressed, however, because of its potential to taint the Board's consideration of the admissibility of the contentions. Dr. Thompson's qualifications to address the issue of spent fuel pool accident risks at nuclear power plants are well-established by his Declaration and his resume, which are attached

to Orange County's Contentions.[1] *See* Declaration of Dr. Gordon Thompson (January 31, 2000) ("Thompson Declaration"), attached as Exhibit 1 to Orange County's Contentions; Curriculum Vitae: Gordon R. Thompson (July 1999), attached as Attachment A to Thompson Declaration. Dr. Thompson has a Ph.D. in applied mathematics from Oxford University, and Bachelors' degrees in mechanical engineering and mathematics and physics from the University of New South Wales. As summarized in his Declaration and detailed in his resume, for over twenty years Dr. Thompson has performed technical analyses of safety and environmental issues related to nuclear facilities in the U.S. and other countries. His work has included the study of high-density spent fuel storage and high-level nuclear waste management.[2]

In addition, Dr. Thompson's February 1999 report, Risks and Alternative Options Associated with Spent Fuel Storage at the Shearon Harris Nuclear Power Plant (attached as Exhibit 2 to Orange County's Contentions), shows that he is familiar with the design of the Harris facility and with the accident risks posed by additional high-density spent fuel storage there. As discussed in more detail below, the "flaws" alleged by the Applicant in this report reflect the Applicant's attempt to misconstrue and muddle the content of Dr.

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1 The Applicant's citation to the arguments made in the NRC Staff's January 4, 2000, brief on criticality prevention is entirely inapposite. *See* Applicant's Response at 2, note 2. There, the Staff challenged Dr. Thompson's qualifications to testify on the issue of criticality prevention, not spent fuel pool accident risks. NRC Staff Brief and Summary of Relevant Facts, Data and Arguments upon which the Staff Proposes to Rely at Oral Argument on Technical Contentions 2 and 3 at 14-19 (January 4, 2000). Moreover, the Licensing Board denied the Staff's motion to disqualify Dr. Thompson. *See* Transcript of January 21, 2000, oral argument at 441.

2 Notably, in 1979, the government of the German state of Lower Saxony accepted Dr. Thompson's findings about the potential for an exothermic reaction in high-density fuel pools. As a direct result, dry storage has been used for away-from-reactor storage of spent fuel throughout Germany. *See* Thompson Declaration, par. 5.

Thompson's report, not a lack of knowledge by Dr. Thompson. Thus, contrary to the Applicant's argument, Dr. Thompson is fully qualified to testify regarding the risks of spent fuel pool accidents at Harris.

III. RESPONSE TO GENERAL ARGUMENTS

The Applicant and Staff argue that the NRC has already taken the "hard look" required by NEPA, in several previous studies. Applicant's Response at 4, Staff's Response at 21. First, the Applicant argues that the 1983 Final Environmental Statement ("FES") "bounded the environmental impacts for single unit operation" because it considered a two-unit operation that also included the storage of more fuel assemblies than is contemplated by the proposed license amendment. According to the Applicant, Harris was originally licensed for up to 7,640 fuel assemblies; in comparison, under the proposed license amendment, the combined inventory of pools A, B, and C will be 7,359 fuel assemblies. *Id.*

This misleading argument ignores the fact that the proposed license amendment would also approve the installation of 1,025 spent fuel storage cells in pool D, bringing the total inventory of spent fuel assemblies that could be stored at Harris to 8,384, over a thousand more spent fuel assemblies than assumed in the 1983 FES. CP&L License Amendment Application, Enclosure 1 at 3 (December 23, 1998).[3] Thus, the original FES was *not* bounding with respect to the number of spent fuel assemblies that could be stored

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3 Pool D will not be filled until a later "campaign," by which time CP&L will also need to have obtained a license amendment permitting it to exceed the license's current 1.0 million BTU/hour limit on the heat load in pools C and D. At that point, however, no further licensing action will be needed on the number of spent fuel assemblies permitted to be stored in pool D. The number of spent fuel assemblies permitted to be stored at the Harris site will have been previously approved in this license amendment proceeding.

at Harris. Moreover, as pointed out in Orange County's Contentions at 6, and not refuted by the Applicant, the 1983 FES did not address the environmental impacts of pool accidents.

Second, the Applicant claims that NUREG-0575, the Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel (1979), took a "hard look" at the environmental impacts of spent fuel storage. This citation begs the question posed by Contention EC-1, however, which is whether new information, obtained since the GEIS was issued 20 years ago, requires the preparation of an EIS in this particular case. The County demonstrates in Contention EC-1 that such an analysis is warranted and required by NEPA.

Third, the Applicant contends that the Commission has determined that there are no significant environmental impacts associated with on-site spent fuel storage generically in the context of license renewal, and in the Waste Confidence Rulemaking. Applicant's Response at 5 and notes 9 and 10. The focus of those rulemakings, however, was whether the lengthening of the time period for storage of spent fuel would create significant additional environmental risks or impacts. The Commission did not undertake a new and vigorous inquiry into the risks of spent fuel pool storage *per se*.

Fourth, the Applicant contends that the Staff addressed the "very issue raised by BCOC – the potential environmental impacts of severe accidents – in NUREG-1353, Regulatory Analysis for the Resolution of Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools" (1989). Applicant's Response at 5. NUREG-1353 is not an Environmental Impact Statement, however, and was never identified as such or circulated for public comment under the requirements of 10 C.F.R. Part 51. Thus, it

cannot be relied on as a NEPA analysis of spent fuel pool accidents. Moreover, NUREG-1353 does not reflect current knowledge regarding the risks of spent fuel pool accidents. *See* Orange County's Contentions at 9-10, Thompson Report at D-8.

The Applicant also argues that Licensing Boards have consistently and correctly accepted NRC Staff determinations that license amendments relating to storing spent fuel have no significant environmental impacts and therefore require no EIS. Applicant's Response at 6. None of the cases cited by the Applicant, however, supports the rejection of the County's environmental contentions. In ALAB-919, for example, the Appeal Board found that the admissibility of NEPA contentions based on severe accident risks should be considered on a "case-by-case basis."[4] The Appeal Board denied the contention on the ground that the intervenors' documents showed the postulated accident scenario to have a "very low probability." I*d.* at 51. However, as the Applicant neglects to acknowledge, this decision was later reversed by the Commissioners, who remanded the contention for a more detailed determination regarding the "plausibility or probability" of the accident postulated by the intervenor.[5] *Id.* at 335.

The most recent decision cited by the Applicant, *Northeast Nuclear Energy Co.* (Millstone Nuclear Power Station), LBP-00-02 (February 9, 2000), rejected a series of environmental contentions regarding the consideration of severe spent fuel pool accidents

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4 *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 42 (1989), *reversed and remanded,* CLI-90-4, 31 NRC 33 (1990), *citing Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-86-12, 24 NRC 1, 12 , *rev'd on other grounds sub. nom. San Luis Obispo Mothers for Peace v. NRC*, 799 F.2d 1268 (9th Cir. 1986).

5 CLI-90-4 was given further clarification in a later decision approving the dismissal of the case. CLI-90-7, 32 NRC 129 (1990). There was never any final determinative ruling on the admissibility of the contention at issue in ALAB-919.

at the Millstone reactor.[6] In rejecting the contentions, the Licensing Board relied on *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-876, 26 NRC 277, 282 (1987) for its holding that "the NRC did not intend to apply its Severe Accident Policy Statement to a license amendment proceeding involving reracking of a spent fuel pool." *Id.*, slip op. at 33-34. However, as noted in ALAB-919, the Third Circuit's decision in *Limerick Ecology Action v. NRC* "undercut the primary underpinning" of ALAB-876. As the Appeal Board explained, in ALAB-876 and a related decision, ALAB-869[7]:

> we clearly relied on the Commission's long-standing distinction between so-called "design-basis" and "beyond design-basis" events and its expert technical judgment that the latter are, by definition, remote and speculative and thus beyond NEPA's mandate. *See* ALAB-869, 26 NRC at 30-31; ALAB-876, and 26 NRC at 283-85. This distinction reflects the very essence of the agency's regulatory philosophy and scheme and had not been seriously questioned by any court until *LEA*. Indeed, in *San Luis Obispo*, 751 F.2d at 1300-01, the District of Columbia Circuit clearly endorsed it.

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6 In Millstone, the Intervenors relied for their environmental contentions on the Thompson Report, although the report does not address any of the site-specific features of the Millstone plant. The Board's decision regarding the admissibility of the Intervenor's severe accident contentions does not appear to be based at all on the Thompson Report, but on the Board's perception that consideration of severe accident risks is legally prohibited. Thus, the decision establishes no precedent with respect to the adequacy of the Thompson Report to support the County's contentions in this case.

7 ALAB-869, 26 NRC 13 (1987), was another *Vermont Yankee* decision regarding the admissibility of contentions regarding beyond-design-basis accidents in spent fuel pools. Relying on the D.C. Circuit's decision in *San Luis Obispo Mothers for Peace v. NRC*, the Appeal Board found that the consideration of severe accidents under NEPA lies within the Commission's discretion. 26 NRC at 31.

ALAB-919, 30 NRC at 51 (footnotes omitted). Thus, LBP-00-02 and ALAB-876 are not consistent with *Limerick Ecology Action v. NRC*, and therefore do not support the Applicant's position.[8]

IV. RESPONSE TO ARGUMENTS REGARDING INDIVIDUAL CONTENTIONS

A. Contention EC-1 Is Admissible.

The Applicant contends that Contention EC-1 must be rejected because the accident scenario described in the contention "is predicated on a chain of highly unlikely events, which are "remote and speculative," and therefore need not be considered under NEPA. According to CP&L, the County postulates the following chain of events:

> 1) a "degraded core" reactor accident; 2) containment bypass; 3) loss of all spent fuel cooling and makeup systems; 4) extreme radiation doses precluding equipment access; 5) inability to restart any pool cooling or makeup systems due to extreme radiation doses; 6) loss of most or all pool water through evaporation; and 7) initiation of an exothermic zirconium oxidation reaction in pools C and D.

Applicant's Response at 9-10. The County agrees that this is a reasonable summary of the postulated accident scenario, with the exception that (2) should be reworded "containment failure or bypass" and (4) should be reworded "extreme radiation doses precluding personnel access."

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8 The Applicant also cites *Pacific Gas & Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-87-24, 26 NRC 159, 166 (1987), but fails to note that it was reversed by the 9th Circuit Court of Appeals in *Sierra Club v. NRC*, 862 F.2d 222 (9th Cir. 1988). Applicant's Response at 3 note 3. In *Sierra Club v. NRC*, the Court held that the Licensing Board had impermissibly considered the merits of a NEPA contention that expansion of spent fuel pool storage capacity would increase the potential for a zircaloy fire. *Id.* at 228.

1. Consideration of Severe Reactor Accidents Is Not Precluded As a Matter of Law.

The Applicant first argues that this chain of events must be found to be remote and speculative as a matter of law because it postulates a "Class 9" or severe beyond design basis reactor accident, which is by definition remote and speculative.[9] Applicant's Response at 9. The Staff also claims that severe accidents need not be considered where no EIS is otherwise required, and that even in initial licensing cases such consideration is discretionary. Staff's Response at 6-7. For a number of reasons, these arguments are entirely without merit. First, the Applicant and Staff's heavy reliance on the 1985 Severe Accident Policy Statement is misplaced. As the Third Circuit U.S. Court of Appeals held in *Limerick Ecology Action v. NRC*, 869 F.2d 723, 736 (3rd Cir. 1989), the Severe Accident Policy Statement is entitled to no deference.[10] Moreover, following the *Limerick* decision, the Commission itself recognized that the question of whether a severe accident scenario is "remote and speculative" cannot be resolved as a matter of law, but must be resolved on the basis of each factual circumstance. *See Vermont Yankee Nuclear*

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9 The somewhat dated "Class 9" designation is roughly the same as a degraded-core accident with containment failure or bypass.

10 The D.C. Circuit's decision in *San Luis Obispo Mothers for Peace v. NRC*, 751 F.2d 1287, 1301 (D.C. Cir. 1984), which upheld the Commission's refusal to supplement an EIS based on the 1980 Interim Policy Statement on Severe Accidents, must be read in light of *LEA v. NRC*. In *San Luis Obispo*, the Court was not specifically asked to address the enforceability of a policy statement. Moreover, the Court's decision recognized the interim nature of the 1980 Policy Statement, and found that the Commission had reasonably concluded that (a) "renewed study" of severe accident risks was needed following the TMI accident; and (b) "until such time as its research yields a contrary result," the Commission's confidence in the low probability of Class 9 accidents was reasonable. 751 F.2d at 1301. Thus, the Court's decision was based in part on the assumption that the Commission would continue to review severe accident risks, and would change this policy if its research were to show the existence of severe accident risks that are not remote and speculative. Such flexibility in considering new information

Power Corp. (Vermont Yankee Nuclear Power Station), CLI-90-4, 31 NRC 333, 335 (1990) (holding that "likelihood or plausibility of the specific accident" must be evaluated in each case); *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), CLI-90-7, 32 NRC 129, 132 (1990) ("future decisions that accident scenarios are remote and speculative must be more specific and more soundly based on the actual probabilities and accident scenarios being analyzed").

2. The Contention Raises a Genuine and Material Factual Dispute Regarding the Foreseeability of a Severe Spent Fuel Pool Accident at Harris.

In a welter of erroneous and misleading factual claims, CP&L and the Staff also challenge the County's factual basis for asserting the foreseeability of a severe reactor accident leading to a loss of water from the spent fuel pools. Applicant's Response at 10-19.[11] These myriad attacks seem calculated to mask a central truth in this case: that in spite of the real potential for such an accident, neither the NRC nor the nuclear industry has ever previously addressed the question of whether a degraded-core reactor accident, with containment failure or bypass, will cause water loss from a spent fuel pool. Given the lack of previous study of this subject, any risk analysis must be gleaned from a variety of studies that evaluate various aspects of the problem, but do not necessarily synthesize them. The County has retained a qualified expert, Dr. Gordon Thompson, to synthesize this information and analyze it in a report.

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about environmental impacts is a cardinal requirement of NEPA decisionmaking.

11 In addition to sowing confusion about the facts, the Applicant also indulges in gratuitous and offensive invectives, such as appear in footnote 17 of the Applicant's Response. The Board should soundly reject such unhelpful attempts to substitute heat for light in this proceeding.

Dr. Thompson has used as much Harris-specific information on accident risks as is available, consisting of the FEIS for the Harris operating license, the IPE, and the IPEEE. He has also used the general risk studies that are available regarding spent fuel pool and reactor accidents. For each aspect of his analysis, he has used the best available information.[12] Moreover, Dr. Thompson has not used these studies uncritically, but has applied his considerable expertise to determine their limitations. His report thoroughly documents the information on which he relies, synthesizes information, explains his analysis, and applies it to the Harris spent fuel pools. His report is based on the existing literature, his own analysis of the literature, and his knowledge about PRA and the operation of nuclear power plants. It includes both quantitative estimates and qualitative judgments. Thus, contrary to the Applicant's and Staff's arguments, the Thompson Report is a highly professional and thorough study of the risk of a severe spent fuel pool accident following a degraded-core accident at Harris, and makes the best possible use of a very limited and uncertain body of information regarding those risks.[13]

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12 In a number of instances in which the Applicant and Staff criticize Dr. Thompson for not using Harris-specific information, the fact is that such information is unavailable. For instance, although the Applicant criticizes Dr. Thompson for using "generic" radiation dose estimates for severe accidents in Figure C-1 of his Report, Applicant's Response at 11, in fact this is the best available information, because the Harris IPE does not contain such information. Table C-1 is demonstrably reasonable because the range of releases underlying Figure C-1 of the Thompson Report is qualitatively similar to the range of releases predicted by the Harris IPE.

13 The Staff attacks the Thompson Report on the ground that it contains no "new information." Staff's Response at 15. To the contrary, the Thompson Report documents and synthesizes the information that has become available over the past twenty years regarding spent fuel pool heat-up and prevention of access in Appendices B and C. He also applies his own expert knowledge to conclude that the partial emptying of a spent fuel is an almost-certain outcome of a degraded-core accident.

Moreover, the specific factual attacks made by the Applicant and Staff are both unfounded and misleading. For example:

a. The Applicant claims that "no specific 'degraded-core' reactor accident is identified, nor is the type, location, and magnitude of alleged bypass." Applicant's Response at 10, note 17. This argument ignores the statement in the contention that "[a] degraded core reactor accident with containment failure or bypass is recognized as a credible event by the NRC for purposes of evaluating environmental impacts in EIS's, as well as requiring emergency planning for the ten and fifty mile Emergency Planning Zone around nuclear plants." Contentions at 11-12. It also ignores the fact that the contention relies in part on the Applicant's own analysis of the likelihood of releases in various degraded-core accident scenarios in the IPE for the Harris plant. *See* Thompson Report at B-6 – B-7. As stated in the Thompson Report, the IPE:

> estimates the probability of release category RC-5 as 3×10^{-6} per reactor-year. Note that the overall probability of core damage is estimated to be 7×10^{-5} per reactor year. Thus, the IPE predicts that 4 percent of core damage sequences would yield a release in category RC-5. Overall, the IPE predicts that 15 percent of core damage sequences would be accompanied by a significant degree of containment failure or bypass, with a total probability of about 1×10^{-5}.[14]

Thompson Report at B-6 – B-7.[15]

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14 The County notes that this probability estimate is a starting point, not an ending point, for evaluating the likelihood of a severe spent fuel pool accident at Harris. In CLI-90-4 and CLI-90-7, the Commission acknowledged its unease with the dismissal of a contention based on a superficial quantitative risk estimate, and therefore called for a detailed evaluation of the elements of risk. 31 NRC at 335; 32 NRC at 132. The County submits that the quantitative risk information submitted in support of Contention EC-1, taken together with other qualitative information, is sufficient to demonstrate a material factual dispute with respect to the plausibility of a severe spent fuel pool accident at Harris.

15 Contrary to the Staff's argument at page 17, it is clear how the 15% figure was reached. The Staff also errs in arguing that Dr. Thompson incorrectly concludes that 15%

b. The Applicant also finds fault with Dr. Thompson's comparison of spent fuel pool boiling probability estimates for the Susquehanna reactor with reactor core damage probability estimates for Harris, arguing that this comparison provides no basis for Dr. Thompson's conclusion that "[t]he similar magnitude of these probabilities suggests that pool accidents could be a major contributor to risk at Harris." Applicant's Response at 10 note 17, *citing* Thompson Report at C-2. However, the Thompson Report discusses the Susquehanna findings simply to illustrate the need for a PRA approach to answering the probability of accidents at the Harris pools. In the same manner, the Thompson Report discusses findings for the Robinson plant. *Id.* at C-2 and C-3. Neither the Thompson Report nor the County's contentions claims that these Susquehanna and Robinson findings directly apply to the Harris plant.

c. The Applicant claims a lack of support for the County's assertion that "[r]estoration of cooling water or makeup of water lost by evaporation would be precluded because onsite radiation levels would prevent access by personnel." Applicant's Response at 10. This objection is specious. The Thompson Report accurately summarizes the release estimates from the Applicant's IPE. *See* Thompson Report at B-6 – B-7. All of these releases involve 100 percent of noble gases, with varying amounts of isotopes. These release estimates support the discussion of radiation levels at page C-4 of the Thompson Report.

d. The Applicant argues that in claiming that restoring spent fuel cooling water may be delayed by high radiation levels following a severe accident, the County "fails to

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of releases would be significant *Id.* For purposes of this discussion, Dr. Thompson reasonably defines releases as "significant" if they would involve a noble gas release of

address the numerous makeup systems available to add water to the Harris pools." Applicant's Response at 12. In support of this argument, the Applicant cites four "safety-grade systems which will be functional and available to provide makeup to the spent fuel pools following a design basis accident at Harris." *Id.*

The argument is both misleading and irrelevant. As shown by the Applicant's own statement, these makeup systems are designed to function in a *design basis accident*; there is no guarantee that they will also function in a degraded-core accident.

e. The Applicant again misleads by claiming that the County "neglects to address the analysis of post severe-accident equipment accessibility in the Harris FSAR." Applicant's Response at 13. According to the Applicant, the FSAR shows that the post severe-accident dose rates in Zone R16, where the pool cooling system would be reinitiated, would be less than 15 mrem/hr one hour after a severe accident. *Id.* This point may be true, but is irrelevant to the contention. The dose rate of 15 mrem/hr one hour is the dose one hour after *a design-basis accident.* Releases from a severe accident would be orders of magnitude higher.[16]

100%.

16 Design-basis accidents are accidents in which most of the radioactivity in the reactor core remains within the fuel pellets, and most of the small fraction which escapes from the pellets is enclosed within plant systems (pipes, vessels, etc.). In a degraded-core accident with containment failure or bypass, a large fraction of the radioactivity in the core will escape from the pellets and then from plant systems, whereupon it will spread throughout the rooms and structure of the plant, spread in a could around the outside of the plant, and travel downwind in a plume. During this process, radioactive particles will adhere to surfaces, creating an intense radiation field which could preclude personnel access for a period of years. Access to parts of the Chernobyl plant, for example, is still precluded after a period of 14 years. The IPE for the Harris reactor does not estimate in-plant dose rates under severe accident conditions; nor, to the County's knowledge, does any NRC document make more than a cursory estimate. Dr. Thompson's Report uses the limited documents that are available regarding this issue. These documents show that

f. The Applicant next claims that the County errs in estimating the bounding decay heat load for pools C and D at 15.6 million BTU/hr. Applicant's Response at 13. According to the Applicant, the license amendment application would limit the heat load in pools C and D to only 1.0 MBTU/hr, not 15.6 MBTU/hr. *Id.* The Applicant is correct in stating that with respect to heat load limits, the instant license amendment application seeks a limit of 1.0 MBTU/hr for pools C and D, because the current cooling system cannot support a higher heat load. It is appropriate to assume 15.6 MBTU/hr for purposes of a NEPA analysis, however, because the application also seeks permission to store 4,715 spent fuel assemblies in pools C and D. The Applicant has conceded that it could not store this many fuel assemblies in pools C and D without obtaining an upgrade of its cooling system, such that it could accommodate 15.6 MBTU/hr. The Applicant plans to seek this modification in the year 2001, a relatively short time from now. For purposes of a NEPA analysis, it is appropriate to look at the impacts of this project when it is realized at full scale as described in the license application, and not to break it into small pieces at each stage at which the Applicant makes some minor adjustment to reach its ultimate goal of accommodating all additional fuel assemblies for which storage is permitted by the proposed license amendment.[17] Such segmented decisionmaking is prohibited under

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dose rates would be vastly higher than 15 mrem/hour. *See* Thompson Report at C-4, which cites an estimate of 4 million rem per hour inside containment. Dose rates in other parts of the plant could be considerably less than 4 million rem per hour, while still being highly lethal. Doses above 10,000 rem will lead to failure of the central nervous system, causing death within a day. *See* Thompson Rport at C-5.

17 It bears emphasizing that the number of spent fuel storage slots in pools C and D that would be authorized by the proposed license amendment is the same as the maximum number of fuel assemblies that could be stored if the heat load limit were raised to 15.6 MBTU/hr.

NEPA. *Susquehanna Valley Alliance v. Three Mile Island*, 619 F.2d 231, 240 Cir. 1980).

g. The Applicant argues that the County "ignores the fact that pools C and D are only permitted to store old fuel which has been cooled for at least 5 years." *See also* Staff Response at 21. There is no licensing basis for this claim: a review of the requested changes to the Harris Technical Specifications shows no such limit. Absent the inclusion of such a fundamental operating limit in the Tech Specs, it cannot be relied on to reject this contention.

In any event, Dr. Thompson's report provides a preliminary, scoping analysis of the relationship between fuel age (after discharge from a reactor) and the potential for exothermic reaction, which would be further developed in the County's evidentiary case. As initial estimates, he considers the initiation of exothermic reaction in fuel aged up to 3 years or up to 9 years. *See* Thompson Report at 8-9, D-9 - D-10. (The shorter time would be for total drainage while the longer time would be for partial drainage). The bases for these estimates is described in the Report. *Id.* Dr. Thompson's initial estimate is that partial drainage will lead to ignition of fuel aged up to 9 years. Thus, Dr. Thompson's report presents an expert opinion on the potential for exothermic reactions in fuel aged over 5 years, which establishes a significant and material dispute with the Staff and the Applicant.

Citing a 1979 Sandia Laboratories Report entitled "Spent Fuel Heatup Following Loss of Water During Storage, the Staff also argues that the County's belief that aged fuel is subject to exothermic reaction "does not appear to be based on the scientific literature." Staff's Response at 22. This argument is without merit. The County explicitly disputes

the adequacy of NRC-sponsored fuel heat-up studies in Appendix D of the Thompson Report, on several grounds. First, the 1979 Sandia study was incomplete or inadequate to address the Harris situation for several reasons, one of which was its assumption of a 13 inch center-center distance (compared with 9 inches for Harris pools C and D).[18] Second, partial drainage has never been addressed in the various NRC-sponsored studies since it was briefly analysed in the 1979 Sandia study. Third, propagation of exothermic reactions from newer to older fuel has never been properly addressed. In Appendix D of his report, Dr. Thompson clearly sets out the nature of the analysis that would be required to gain a proper understanding of the fuel heatup problem, and contrasts this with the incomplete studies that the NRC has sponsored.[19]

h. The Applicant argues that the County provides no support or explanation for its claim that the probability of a substantial release of radioactive material from pools C and D would be comparable to the probability of a substantial release from the Harris reactor. Applicant's Response at 17. This argument ignores the simple logic of the County's claim, which is explained in the contention. A loss of water from the Harris

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18 Nevertheless, the Sandia analysis showed that fuel temperature in the potential drainage (blocked inlets) case would rise to the point where a runaway exothermic reaction would be initiated. *See* Thompson Report, Figure 3D. Thus, the analysis shows clearly that partial drainage is a worse case than total drainage.

19 In disputing the County's claims regarding the likelihood of exothermic reactions, the Staff repeatedly mischaracterizes the content of Contention EC-1. For example, the Staff claims that BCOC envisions the propagation of an exothermic air reaction from pools A or B to C or D. Staff Response at 20. The County makes no such claim. The Staff's discussion of exothermic reactions also implies that they are limited to air-zirconium reactions. *See* Staff Response at 19-22. In fact, partial drainage will lead to steam-zirconium reaction, as the Thompson Report makes clear. *Id.* at D-6. Moreover, the Staff argues that the upper bound of temperature rise is given for fuel aged 1 year in the Thompson Report. Staff Response at 14, note 7. In fact, the calculated

spent fuel pools by evaporation is an almost certain outcome of a severe degraded-core reactor accident at Harris; therefore, the probability of a severe accident involving loss of spent fuel pool cooling water would be linked to, and equivalent to, the probability of a degraded core reactor accident. If fuel aged up to 9 years will ignite following partial draining, as indicated by Dr. Thompson's initial estimate, and pools C and D contain fuel aged less than 9 years, then loss of fuel pool water will almost certainly lead to ignition of fuel in pools C and D.

i. The Applicant and Staff also object to the portion of the contention which claims that the use of burnup credit will significantly increase the probability that a criticality accident would occur at the Harris plant. Applicant's Response at 17, Staff Response at 22. The Applicant first faults the County for failing to describe a "scenario" in which this would occur. A criticality accident constitutes a design basis accident, however, for which no such scenario is required. One of the cardinal assumptions of an EIS is that all safety regulations are satisfied. By violating such a fundamental NRC safety regulation, CP&L necessarily would be creating a significant and unacceptable level of risk. [20]

Moreover, the NRC stated in NUREG-0575 that preventing criticality accidents is a "major consideration in planning for compact storage at existing plants." NUREG-0575, Generic Environmental Impact Statement for Handling and Storage of Spent Light

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upper bound is 11Q degrees C per hour, and Q is a variable parameter. Thompson Report at D-3.

20 The NRC also argues that Dr. Thompson is not qualified to analyze criticality. Staff's Response at 22-23. This argument ignores the fact that the Licensing Board denied the Staff's motion to strike Dr. Thompson's testimony on Contention TC-2, and thereby implicitly accepted Dr. Thompson's qualifications to testify as an expert on

Water Power Reactor Fuel, Vol. 1 at 3-5 (1979). Thus, the GEIS implicitly found that a criticality accident would have a significant environmental impact. Even if no violation of NRC safety regulations were found in this case, the fact remains that the Applicant is proposing a means of preventing a criticality accident, whose effectiveness has never previously been evaluated in a NEPA context. This, by itself, requires a NEPA analysis.[21]

j. Both the Applicant and Staff contend that the County has not provided a sufficient basis for contending that the proposed license amendment poses a significantly increased risk of sabotage. Their principal complaint is that the contention does not provide credible scenarios or factual links to the Harris design. To the contrary, the Thompson Report does provide a scenario, at pages C-5 and C-6. In any event, it is not necessary to posit a scenario, however, to compare the sabotage risks of spent fuel storage and dry cask storage. It is the County's position that dry cask storage should be considered as a Severe Accident Mitigation Design Alternative ("SAMDA") because it is qualitatively more resistant to sabotage than wet storage. The contention is supported by Dr. Thompson's expert opinion that a sabotage/terrorism event at a dry cask storage facility could release "only a small fraction of the radioactive material that could be released by a sabotage/terrorism event at the Harris pools in their present and proposed configuration." Thompson Report at 12.

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criticality prevention. *See* note 1, *supra.*

21 The County notes in this context that to some extent, the disposition of this aspect of the basis for Contention EC-1 will be governed by the Board's disposition of Contention TC-2. Even if the Board finds that CP&L's license amendment application satisfies GDC 62, however, there is still a question as to whether the Applicant's proposed measures for preventing criticality have ever been addressed previously in an

B. Contention EC-2 Is Admissible.

Contention EC-2 argues that the Environmental Assessment ("EA") for the proposed license amendment is deficient because it fails to acknowledge or evaluate the cumulative environmental risk posed by the operation of pools A, B, C, and D. The legal authority for this requirement is stated in the contention, including Baltimore Gas and Electric Company v. Natural Resources Defense Council, 462 U.S. 87 (1983), the Court and CEQ regulations at 40 C.F.R. 1508.7 and 1508.8 (1982). The Applicant's response to this contention confuses the issue. The County is not arguing that cumulative impacts trigger an EIS, but that once an EIS is required, it must consider cumulative as well as incremental impacts.

The Applicant and Staff also argue that the County fails to provide a factual basis regarding the cumulative impacts of operating pools A and B. This argument ignores the fact that Contention EC-2 explicitly incorporates by reference Basis F of Contention EC-2.[22] The Applicant and Staff also take issue with this Contention's statement that "a more complete understanding of the cumulative accident risk associated with fuel storage at Harris would flow from an integrated risk evaluation that considered pools A, B, C and D." This is a technical factual proposition, supported by the expert opinion of Dr.

EIS.

22 The Applicant and Staff apparently did not take note of the Errata filed by the County on February 7, 2000, which corrects a typographic error on page 17, where a reference to Section E was changed to Section F. Basis F supports this contention as follows: note 5 of Basis F asserts that new information "demonstrates that the component of the baseline accident risk at Harris arising from the operation of pools A and B has not been evaluated properly and is greater than represented in the GEIS or the 1983 EIS for Harris." At page 13, Basis F also asserts that "the conditional probability of an exothermic reaction in pools C and D would be comparable to or greater than the

Thompson, regarding a preferable means for evaluating cumulative impacts. As such, the statement is admissible.

C. Contention EC-3 Is Admissible.

The Applicant and Staff both oppose the admission of Contention EC-3, which asserts that an EIS for the Harris license amendment should consider the environmental impacts of storing fuel from the Brunswick and Robinson nuclear power plants. They argue this because Harris is already authorized to receive spent fuel from Brunswick and Robinson. The County continues to rely for its position on the reasoning of the Licensing Board in *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), LBP-88-19, 28 NRC 145 (1988), which concluded that there is no independent utility to the re-racking of a spent fuel. Moreover, the large quantity of fuel that CP&L seeks to ship from Robinson and Brunswick to the Harris plant could not be stored at Harris *but for* the issuance of the proposed license amendment. NEPA requires that an EIS consider the foreseeable consequences of federal actions, which in this case will include massive shipments of spent fuel to Harris from around the State of North Carolina. The County stands on the arguments made in the contention and on the oral argument made by its counsel during the May 15, 1999, Prehearing Conference. *See* Transcript at 157-160, 165-167. The contention should be admitted.

D. Contention EC-4 Is Admissible.

The Applicant and Staff both oppose the admission of Contention EC-4, which seeks the preparation of a discretionary EIS. The County stands on the arguments made

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conditional probability of a similar reaction in pools A and B, and would be substantial over a range of pool loading patterns."

in its contention. If the Board denies admission of this contention, the County requests that it be referred to the Commissioners for consideration.

III. CONCLUSION

For the foregoing reasons, the Applicant and Staff have failed to justify their opposition to the admission of Orange County's environmental contentions. The contentions are admissible and should be admitted.

Respectfully submitted,

Diane Curran
Harmon, Curran, Spielberg, & Eisenberg, L.L.P.
1726 M Street N.W., Suite 600
Washington, D.C. 20036
202/328-3500
e-mail: Dcurran@harmoncurran.com

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