Spent Fuel

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 16, 2000

SECRETARY

The Honorable John Edwards
United States Senate
Washington, DC 20010

Dear Senator Edwards:

I am responding to your letter dated May 5, 2000, addressed to Chairman Richard A. Meserve. Your letter urged a grant of an evidentiary hearing in the Shearon Harris spent fuel pool expansion proceeding (Docket No. 50-400-LA) that is currently before an Atomic Safety and Licensing Board. Under the Nuclear Regulatory Commission's procedural rules for adjudications, the Commission has an appellate role in proceedings commenced before its Atomic Safety and Licensing Boards. Because of that role, I trust that you will understand that the Commissioners must remain impartial during the pendency of a case, whether it is before a Licensing Board or on appeal to the Commission.

On May 5, 2000, the Licensing Board for the Shearon Harris proceeding issued a Memorandum and Order (LBP-00-12) which denied the request of intervenor Board of Commissioners of Orange County, North Carolina, for an evidentiary hearing regarding the two technical contentions before the Board. A copy of that decision is enclosed. However, the intervenor's request to admit four late-filed environmental contentions remains pending with the Board.

A copy of your letter and this response will be placed on the Shearon Harris hearing docket and served on the parties to the proceeding.

Sincerely,

Annette Vietti-Cook

Annette L. Vietti-Cook

Enclosure: As stated

cc: Service List w/o enclosure

A/b

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-00-12

ATOMIC SAFETY AND LICENSING BOARD

'00 MAY -5 P2:51

Before Administrative Judges:

G. Paul Bollwerk, III, Chairman
Frederick J. Shon
Dr. Peter S. Lam

SERVED MAY - 5 2000

In the Matter of	Docket No. 50-400-LA
CAROLINA POWER & LIGHT COMPANY	ASLBP No. 99-762-02-LA
(Shearon Harris Nuclear Power Plant)	May 5, 2000

MEMORANDUM AND ORDER
(Ruling on Designation of Issues for an Evidentiary Hearing)

Pending before the Licensing Board in this 10 C.F.R. Part 2, Subpart K proceeding are the parties' pleadings addressing the question whether, in accordance with 10 C.F.R. § 2.1115, to designate for an evidentiary hearing either of the two admitted issues of intervenor Board of Commissioners of Orange County, North Carolina (BCOC). With these contentions -- Technical Contention 2 (TC-2), Inadequate Criticality Prevention, and Technical Contention 3 (TC-3), Inadequate Quality Assurance -- BCOC challenges Carolina Power and Light Company's (CP&L) December 23, 1998 application to amend the operating license for its Shearon Harris Nuclear Power Plant (Harris or HNP) to permit the addition of rack modules to spent fuel pools

(SFPs) C and D and to place those pools in service. BCOC asserts that it has established there are disputed material facts relative to each of the contentions that warrant further exploration in an evidentiary hearing. In contrast, CP&L and the NRC staff declare that BCOC has failed to establish there is any need for such an additional proceeding and, as a consequence, the portion of this proceeding relating to these contentions should be dismissed.

For the reasons set forth below, we find relative to the issues raised by contentions TC-2 and TC-3 that (1) BCOC has failed to show there is a genuine and substantial dispute of fact or law that can be resolved only by the introduction of evidence at an evidentiary hearing; and (2) based on the record before us, applicant CP&L has met its burden to establish that its proposed licensing action is in compliance with the requirements of the Atomic Energy Act and the agency's implementing regulations, warranting disposition of these issue in its favor.

I. BACKGROUND

A. Procedural Matters

In the Board's ruling in LBP-99-25, 50 NRC 25 (1999), in which we found that intervenor BCOC had standing and had presented admissible contentions so as to warrant its

admission as a party to this proceeding, we described the circumstances surrounding the CP&L license amendment request as follows:

> In its December 1998 license amendment request, CP&L indicated that the fuel handling building (FHB) at the Harris site was originally designed and constructed with four separate spent fuel pools to accommodate the four reactor units that were planned for the site. Pools A through D were anticipated to serve Units 1 through 4, respectively. Although three of the units were canceled in the early 1980's, the FHB, the four pools (with liners), and the cooling and cleanup system to support pools A and B were completed and turned over to CP&L. Construction on the cooling and cleanup system for pools C and D, however, was not completed. CP&L also declared that because a Department of Energy high-level waste repository is not expected to be available in the foreseeable future, it has been shipping spent fuel from its three other nuclear facilities for storage in the Harris pools in order to maintain full core offload capability for those facilities. According to CP&L, the present amendment request to utilize pools C and D is designed to provide storage capacity for all four CP&L units -- Harris, Brunswick Steam Electric Plant, Units 1 and 2, and H.B. Robinson, Unit 2 -- through the end of their current operating licenses.

Id. at 27-28 (citation omitted). Relative to the CP&L amendment request, we admitted contentions TC-2 and TC-3. As admitted, TC-2 provides:

> Storage of pressurized water reactor ("PWR") spent fuel in pools C and D at the Harris plant, in the manner proposed in CP&L's license amendment application,

> would violate Criterion 62 of the General Design Criteria ("GDC") set forth in Part 50, Appendix A. GDC 62 requires that: "Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations." In violation of GDC 62, CP&L proposes to prevent criticality of PWR fuel in pools C and D by employing administrative measures which limit the combination of burnup and enrichment for PWR fuel in pools C and D by employment of administrative means which limit the combination of burnup and enrichment for PWR fuel assemblies that are placed in those pools. This proposed reliance on administrative measures rather than physical systems or processes is inconsistent with GDC 62.

Id. at 35. In doing so, we found that this contention was adequately supported by two bases, which were summarized as follows:

> Basis 1 -- CP&L's proposed use of credit for burnup to prevent criticality in pools C and D is unlawful because GDC 62 prohibits the use of administrative measures, and the use of credit for burnup is an administrative measure.
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> * * * * *
>
> Basis 2 -- The use of credit for burnup is proscribed because Regulatory Guide 1.13 requires that criticality not occur without two independent failures, and one failure, misplacement of a fuel assembly, could cause criticality if credit for burnup is used.

Id. at 35, 36. So too, we admitted contention TC-3, which provides:

CP&L's proposal to provide cooling of pools C & D by relying upon the use of previously completed portions of the Unit 2 Fuel Pool Cooling and Cleanup System and the Unit 2 Component Cooling Water System fails to satisfy the quality assurance criteria of 10 C.F.R. Part 50, Appendix B, specifically Criterion XIII (failure to show that the piping and equipment have been stored and preserved in a manner that prevents damage or deterioration), Criterion XVI (failure to institute measures to correct any damage or deterioration), and Criterion XVII (failure to maintain necessary records to show that all quality assurance requirements are satisfied).

Moreover, the Alternative Plan submitted by Applicant fails to satisfy the requirements of 10 C.F.R. § 50.55a for an exception to the quality assurance criteria because it does not describe any program for maintaining the idle piping in good condition over the intervening years between construction [and] implementation of the proposed license amendment, nor does it describe a program for identifying and remediating potential corrosion and fouling.

The Alternative Plan submitted by Applicant is also deficient because 15 welds for which certain quality assurance records are missing are embedded in concrete and inspection of the welds to demonstrate weld quality cannot be adequately accomplished with a remote camera.

Finally, the Alternative Plan submitted by Applicant is deficient because not all other welds embedded in concrete will be inspected by the remote camera, and the weld quality cannot be demonstrated adequately by circumstantial evidence.

Id. at 36-37.

Following the Board's ruling on standing and contentions, as was its right pursuant to 10 C.F.R. § 2.1109, applicant CP&L filed a timely request that the procedural construct of 10 C.F.R. Part 2, Subpart K, be utilized to conduct this proceeding. As a consequence, in accordance with section 2.1111, the Board gave the parties a limited period within which to conduct discovery regarding these contentions.[1] Thereafter, as is provided for in section 2.1113(a), on January 4, 2000, the parties submitted written summaries of the facts, data, and arguments on which they intended to rely at an oral argument intended to provide them with an opportunity to discuss whether or not there were any genuine and substantial factual or legal disputes that merited further exploration in an evidentiary hearing. Then, on January 21, 2000,[2] the Board conducted a

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[1] Although the original discovery period was limited to the 90 days specified in section 2.1111, the Board granted an unopposed four-day extension to permit several depositions to be completed. See Licensing Board Order (Granting Discovery Extension Request) (Oct. 18, 1999) at 1-2 (unpublished).

[2] Although section 2.1113(a) provides that the parties' oral presentations should occur within 15 days of the filing of the parties' written summaries, the 17-day interval here was arrived at after consultation with the parties in response to a staff request to extend the deadline originally set for the filing of written summaries. See Licensing Board Memorandum and Order (Extending Time for Written Summaries and Oral Argument) (Dec. 13, 1999) at 1-3 (unpublished).

day-long proceeding in which it entertained the parties' oral presentations on the question whether there were disputed factual or legal issues relative to either of the admitted contentions that merited further consideration in an evidentiary hearing with live witnesses and party cross-examination. See Tr. at 190-442.

B. Technical/Regulatory Matters

As it is relevant to this proceeding and is described in the NRC staff's January 4, 2000 written summary, the December 23, 1998 CP&L license amendment request at issue in this proceeding contains two parts:[3]

> 1. A revision to Technical Specification (TS) 5.6 to identify pressurized water reactor (PWR) burnup restrictions, boiling water reactor (BWR) enrichment limits, pool capacities, heat load limitations and nominal center-to-center distances between fuel assemblies in the racks to be installed in SFPs "C" and "D." CP&L proposed to use higher density fuel racks in SFPs C and D than are currently used in SFPs A and B. The use of the higher density racks requires additional administrative controls on PWR burnup and BWR enrichment to ensure [K-effective (Keff)] less than or equal to 0.95.

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[3] The application also addresses a safety issue regarding the additional heat load on the component cooling water system, which is not part of the current controversy before the Board. See 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 (Jan. 4, 2000) at 7.

> 2. An alternative plan in accordance with the requirements of 10 CFR 50.55a to demonstrate an acceptable level of quality and safety in completion of the component cooling water (CCW) and SFPs 'C' and 'D' cooling and cleanup system piping. In order to activate SFPs C and D, it is necessary to complete construction of the cooling and cleanup system for these pools and to install tie-ins to the existing HNP Unit 1 {CCW system] to provide heat removal capabilities. Approximately 80% of the SFP cooling and cleanup system piping and the majority of the CCW piping was installed during the original plant construction. At the time that construction on the SFP cooling system was discontinued following cancellation of HNP Unit 2, a formal turnover of the partial system was not performed and CP&L has since discontinued its N Certificate program. Also, some of the field installation records for the completed piping are no longer available. As a result, the system when completed will not satisfy [American Society of Mechanical Engineers (ASME)] Section III code requirements (i.e., will not be N stamped). Therefore, CP&L submitted an Alternative Plan in accordance with 10 CFR 50.55a(a)[(3)] to demonstrate that the completed system will provide[] an acceptable level of quality and safety.

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 (Jan. 4, 2000) at 5-6 [hereinafter Staff Summary].

Relative to these revisions, the scope and interpretation of several regulatory provisions are at issue. In the case of contention TC-2, which concerns the

issue of criticality control,[4] a measure of significant

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[4] In its January 4, 2000 summary, the staff provides the following discussion of criticality that outlines the basic technical principals involved relative to contention TC-2:

> Criticality is the achievement of a self-sustaining nuclear chain reaction. The chain reaction proceeds as atoms of a fissile material absorb slow (thermal) neutrons and split (fission) into new light atoms (*i.e.*, fission products) and additional neutrons that, in turn, interact with additional fissile atoms. Neutrons resulting from fission have high energy and are called "fast" neutrons. Fast neutrons are not readily captured in U-235, the fissile material originally present in fresh fuel. Rather, a neutron must lose energy and "slow down," or become "thermalized" (a thermal neutron), in order to be readily captured in U-235 and cause fission.
>
> In order for fast neutrons to slow down, they must collide with, and transfer energy to, atoms. This process is called "moderation." A light element (such as hydrogen) is an effective moderator because the mass of its nucleus is on the same order as that of a neutron. Therefore, upon initial collision, the neutron imparts most of its energy to the hydrogen nucleus and becomes thermalized. Water, with its high hydrogen content, is the moderator in a light water reactor (LWR) such as Harris.
>
> After being created through fission, during the process of moderation, and after reaching thermal energy levels, a neutron may undergo several events. It may be absorbed by nonproductive capture in the fuel, the moderator, or the structural materials. It may leak from the reactor system and

(continued...)

[4](...continued)
either be reflected back into the system or be lost. Finally, it may be absorbed by the U-235, cause fission, and produce more fast neutrons.

When the process continues on its own, the system of atoms of fissile material is said to be critical. The measure of criticality is the effective neutron multiplication factor, k-effective, or k_{eff}. The multiplication factor is the ratio of the rate of neutron production to neutron loss due to fission, nonproductive capture, and leakage. K-infinity, or k_{inf}, is the infinite multiplication factor, which refers to the neutron muliplication of an infinite system. For a given system or array of fuel, k_{inf} is always greater than k_{eff} because k_{inf} does not include loss of neutrons from leakage. Criticality is achieved when k_{eff} is equal to 1.0. When k_{eff} is less than 1.0, the system is subcritical. Criticality can only occur in an array of LWR fuel if sufficient fissile material is available in a near-optimum geometry and a moderator (water) is present. No array of LWR fuel can achieve criticality without water moderation present in the array. Well-developed mathematical models (equations) exist in present-day computer codes and are used to compute k_{eff}.

"Reactivity" is defined as $(k_{eff} -1)/k_{eff}$. When fuel is irradiated in a reactor as a result of operation and power generation, the reactivity of the fuel decreases over the design life of the fuel assembly. This reduction of reactivity with irradiation is called "burnup." Burnup is caused by the change in fissile content of the fuel (*i.e.*, depletion of U-235 and production

(continued...)

concern is General Design Criterion (GDC) 62, which provides:

> Prevention of criticality in fuel storage and handling. Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations.

10 C.F.R. Part 50, App. A, Criterion 62. Also at issue is the so-called "double contingency principle" (DCP) of staff draft Regulatory Guide 1.13, App. A, at 1.13-9 (proposed rev. 2, Dec. 1981) (emphasis in original), which states:

> At all locations in the [light water reactor (LWR)] spent fuel storage facility where spent fuel is handled or stored, the nuclear criticality safety analysis should demonstrate that

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[4](...continued)
of Pu-239 and other fissile actinides), the production of actinide absorbers, and the production of fission product neutron absorbers. Before each reactor operating cycle, a licensee performs a reload analysis that predicts the burnup of each fuel assembly during the cycle. These calculations are confirmed during the cycle by measurements of various operating characteristics, such as boron concentration and power distribution. After every operating cycle (typically 1 to 2 years), approximately 1/3 of the fuel in a reactor is removed because its reactivity is too low to effectively contribute to power generation in the reactor environment. This irradiated (or spent) fuel is generally placed in a spent fuel pool at the reactor site and is replaced in the reactor by fresh (unirradiated) fuel.

Staff Summary at 20-22 (citations omitted).

> criticality could not occur without at least two unlikely, independent, and concurrent failures or operating limit violations.

In connection with contention TC-3 and the so-called Alternative Plan submitted by CP&L to show that its cooling and cleanup system piping meets agency regulatory requirements, several different provisions of 10 C.F.R. § 50.55a are potentially relevant, including the following:

> (a)(1) Structures, systems, and components must be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety function to be performed.
>
> * * * * *
>
> (3) Proposed alternatives to the requirements of . . . this section or portions thereof may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant shall demonstrate that:
>
> (i) The proposed alternative would provide an acceptable level of quality and safety . . . .

In particular, BCOC contends that the CP&L Alternative Plan proposal fails to satisfy three of the quality assurance (QA) criteria of Appendix B to 10 C.F.R. Part 50. In describing these criteria, the staff correctly notes:

> Appendix B requires the development and application of a [QA] program for the design, fabrication, construction, and testing of the structures, systems, and components of the facility at the construction permit stage, and a QA program for man[a]gerial and

> administrative controls at the operating license stage. Appendix B establishes the QA requirements for such structures, systems and components.
>
> Criterion XIII provides, as pertinent here, that "[m]easures shall be established to control the handling, storage, shipping, cleaning and preservation of material and equipment in accordance with work and inspection instructions to prevent damage or deterioration."
>
> Criterion XVI provides that "[m]easures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. . . .["]
>
> Criterion XVII provides that "[s]ufficient records shall be maintained to furnish evidence of activities affecting quality. . . . Records shall be identifiable and retrievable.["]

Staff Summary at 11.

II. ANALYSIS

A. Standards Governing 10 C.F.R. § 2.1115 Determination Regarding the Need for An Evidentiary Hearing to Resolve Admitted Issues

The procedures in 10 C.F.R. Part 2, Subpart K, were established in response to a congressional mandate found in the Nuclear Waste Policy Act of 1982 (NWPA). Specifically, NWPA § 134(a)-(b), 42 U.S.C. § 10154(a)-(b), states that for any reactor operating license amendment "to expand the spent

nuclear fuel storage capacity at the site of a civilian nuclear power reactor," the Commission was to provide parties to any hearing proceeding on the expansion amendment with the opportunity to present facts, data, and arguments, by way of written summaries and sworn testimony, and an oral argument. Based on the summaries and the argument, the Commission then is to designate "any disputed questions of fact, together with any remaining questions of law, for resolution in an adjudicatory hearing" if the Commission finds that "there is a genuine and substantial dispute of fact which can only be resolved with sufficient accuracy by the introduction of evidence at an adjudicatory hearing," and "the decision of the Commission is likely to depend in whole or in part on the resolution of such dispute." Sections 2.1113 and 2.1115 of 10 C.F.R. incorporate these requirements. In addition, section 2.1115(a)(1)-(2) provides that the presiding officer shall "[d]esignate any disputed issues of fact, together with any remaining issues of law, for resolution in an adjudicatory hearing," and "[d]ispose of any issues of law or fact not designated for resolution in an adjudicatory hearing." Moreover, as we have previously noted, notwithstanding the agency's rules of practice that place the ultimate burden of proof on CP&L, as the license applicant, with respect to a merits disposition of any substantive matter at issue in this proceeding (i.e.,

the admitted BCOC contentions), relative to the central Subpart K issue of the existence of disputed material facts requiring an evidentiary hearing, "'the burden . . . [is] on the party requesting adjudication.'" Licensing Board Memorandum and Order (Subpart K Oral Argument Procedures) (Jan. 13, 2000) at 2 (quoting 50 Fed. Reg. 41,662, 41,667 (1985) (statement of considerations for final rule adopting Subpart K)) (unpublished).

It is against these standards that we review the parties' filings and oral argument presentations.

B. Contention TC-2

1. Basis One

DISCUSSION: Detailed Summary of Facts, Data and Arguments and Sworn Submission on Which [BCOC] Intends to Reply at Oral Argument to Demonstrate the Existence of a Genuine and Substantial Dispute of Fact with [CP&L] Regarding the Proposed Expansion of Spent Fuel Storage Capacity at the Harris Nuclear Power Plant With Respect to Criticality Prevention Issues (Contention TC-2) (Jan. 4, 2000) at 19-41 [hereinafter BCOC TC-2 Summary]; Summary of Facts, Data, and Arguments on Which Applicant Proposes to Rely at the Subpart K Oral Argument (Jan. 4, 2000) at 29-55 [hereinafter CP&L Summary]; Staff Summary at 31-40; Tr. at 218-232, 254-262, 276-78, 285-86, 287-292, 296-98, 305-308.

a. BCOC Position. Regarding basis one of contention TC-2, referencing the supporting affidavit of Institute for Resource and Security Studies executive director Dr. Gordon Thompson, BCOC asserts that the CP&L license application is inadequate because it places impermissible reliance on administrative procedures and controls for criticality prevention. Instead, according to BCOC, CP&L should be relying entirely on physical systems or processes as required by the proper interpretation of GDC 62. Noting that under Part 50, Appendix A, GDCs are considered principal reactor design criteria minimum requirements, see 10 C.F.R. Part 50, App. A, Introduction, BCOC declares that the requirement of GDC 62 that criticality in a facility's fuel storage and handling system must be prevented by "physical systems or processes, preferably by use of geometrically safe configurations," clearly precludes the use of administrative controls, such as the burnup/enrichment level controls and SFP soluble boron presence that are being relied upon by CP&L to avoid criticality problems. According to BCOC, this follows from the plain language of GDC 62, which specifies physical systems or processes and provides the example of safe fuel bundle geometrical configurations. Moreover, BCOC declares, notwithstanding the fact that any physical measure has some administrative component, there is a basic difference

between a physical and administrative measure in that the latter requires continuing human interaction and concomitantly is subject to human error.

Relative to the first point, BCOC asserts that the rulemaking history of GDC 62 supports its plain language argument, including Atomic Energy Commission (AEC) pre-rulemaking documents; the June 1967 AEC draft GDC, which (like the pre-rulemaking documents) stated that "[s]uch means as geometrically safe configurations shall be emphasized over procedural controls"; September 1967 Oak Ridge National Laboratory (ORNL) comments on the draft criticizing the reference to procedural controls; and the AEC February 1971 final rule, which provided the present GDC 62 language without any reference to procedural controls. BCOC further maintains that other relevant NRC criticality standards, including (1) 10 C.F.R. § 70.24, regarding criticality monitoring for significant special nuclear material quantities; (2) section 50.68, which establishes a blanket exemption from section 70.24 for those agreeing to follow specified criticality accident prevention requirements; and (3) section 72.124, which establishes criticality control measures for independent spent fuel storage installations (ISFSIs), do not contradict this plain language meaning.

Against this backdrop, BCOC concludes it is clear that the CP&L license amendment proposal to restrict the burnup/enrichment of the fuel being placed in the pools to suppress criticality, which relies on ongoing administrative controls to maintain those limits, violates the language and intent of GDC 62. Nor does staff draft Regulatory Guide 1.13, which allows fuel enrichment and burnup limits for spent fuel pool criticality control, permit a different result given that this staff guidance document cannot modify or circumvent a regulatory requirement like GDC 62. Finally, according to BCOC, the staff's willingness to permit CP&L (and numerous others) to use burnup/enrichment controls under Regulatory Guide 1.13 without performing any kind of a systematic safety analysis is inconsistent with its public health and safety responsibilities, particularly in light of several reported incidents involving SFP assembly mispositioning and a boron dilution event that are described in Appendix C to the BCOC January 4, 2000 summary.

b. CP&L Position. CP&L first asserts that BCOC has impermissibly changed its position regarding basis one from the assertion that no administrative measures are allowed under GDC 62 to a declaration that there are appropriate administrative measures and that the burnup/enrichment controls sought by CP&L fall into the impermissible category because those measures must be maintained on an ongoing

basis. Additionally, referencing the affidavit of Holtec International Senior Vice President and Chief Nuclear Scientist Dr. Stanley E. Turner, CP&L declares that the staff's consistent interpretation of GDC 62 to allow burnup/enrichment limits is appropriate because (1) every practical spent fuel pool criticality control measure -- geometric separation, solid neutron absorbers, soluble neutron absorbers, fuel reactivity, and fuel burnup -- is a physical process or system involving some administrative measures; (2) the regulatory history of GDC 62 shows that administrative measures have always been understood to be part of criticality control physical systems or processes; (3) the recently-adopted section 50.68 explicitly contemplates and permits criticality control administrative measures, including fuel enrichment and burnup limits; (4) the staff's two-decades old interpretation of GDC 62 should be accorded considerable weight; and (5) the new BCOC interpretation highlights the absurdity of its original, "no administrative measures" position.

On the initial point, CP&L declares that BCOC has admitted in discovery that the five criticality control measures listed above are physical systems or processes and that each is implemented using administrative measures. CP&L also maintains there is nothing in GDC 62 that differentiates between criticality controls based on the

timing or duration of the implementing administrative measures involved. In connection with the regulatory history of GDC 62, CP&L maintains that the metamorphosis from the July 1967 draft standard referenced by BCOC to the final language establishes that the reference to "physical procedures or processes" includes administrative controls like enrichment/burnup credits while the stated preference for the "use of geometrically safe configurations" is not intended to foreclose the use of such administrative controls.

Regarding 10 C.F.R. § 50.68, which provides requirements intended to prevent criticality accidents in instances when a section 70.24 monitoring system is not utilized, CP&L asserts that this recently adopted provision also establishes the viability of administrative controls under GDC 62. Noting that, like GDC 62, section 50.68 is intended to prevent inadvertent criticality events, CP&L discusses various staff and Commission statements in the context of the 1998 rulemaking regarding section 50.68 that it contends establish these administrative controls are permissible under GDC 62. CP&L also relies on the language of section 50.68(b)(4) regarding the effects of fuel burnup, which it finds implies the fuel burnup limits are a permitted criticality control method, and of section 50.68(b)(7) permitting the use of fuel enrichment

limits for criticality control, as evidence that these control measures are within the confines of GDC 62.

Also compelling, CP&L declares, is the consistent staff interpretation of GDC 62 to include the use of fuel enrichment and burnup limits for criticality control, which goes back to the adoption of draft Regulatory Guide 1.13 in 1981, and includes some twenty staff license amendment approvals of the use of fuel enrichment and burnup limits as criticality controls. Also relevant, CP&L asserts, is the staff's August 1998 Criticality Guidance document, which CP&L declares effectively replaces Regulatory Guide 1.13 and approves fuel enrichment and burnup limits as criticality control measures.

Finally, CP&L disparages what it labels BCOC's attempt to change its admitted contention during discovery by outlining a position that some administrative measures are permitted under GDC 62, but not those proposed by CP&L relative to its SFP expansion request. In addition to being impermissibly late, CP&L asserts, there is nothing in the text of GDC 62 that differentiates between criticality control methods based on the timing and duration of administrative measures implementation. It also finds inapposite the BCOC Summary Appendix C incidents involving SFP assembly mispositioning and a boron dilution event. According to CP&L, of the nineteen incidents specified, only

six apparently involve fuel misplacement, as would be relevant to the BCOC contention, and of those, five involve fuel loading in a checkerboard pattern that is not applicable to the Harris facility. The sixth, involving a failure to verify independently fuel move sheets, also is not applicable, according to CP&L, because, as is explained in the accompanying affidavit of CP&L Spent Pool Project Supervisor R. Steven Edwards, CP&L has a series of redundant checks that will prevent such an incident from occurring.

c. Staff Position. According to the staff, the language of GDC 62, its regulatory history, staff practice under that provision, and agency adjudicatory and rulemaking action authorizing the use of administrative controls to prevent criticality, all support the CP&L position relative to this portion of contention TC-2. Like CP&L, the staff finds that the change in the language of GDC 62 from the original AEC proposal to the present wording does not preclude the use of administrative controls, but instead reflects a preference for geometrical configurations as a criticality control measure. The staff also notes that because GDC 62 applies to both fuel handling and fuel storage systems and because the former necessarily requires the use of administrative controls as single fuel assemblies are moved, to adopt the BCOC reading of that provision would undermine the imposition of fuel handling criticality

requirements. In addition, the staff declares that over the past eighteen years under GDC 62 it consistently has authorized the administratively controlled criticality measure of burnup credit without an accident, permissions that in several instances were subjected to unsuccessful adjudicatory challenges. Also, the staff points out, several agency adjudicatory decisions appear to accept the staff-endorsed concept of administrative controls to prevent SFP criticality, including Consumers Power Co. (Big Rock Point Nuclear Plant), ALAB-725, 17 NRC 562, 564-65, 571 (1983), and Florida Power & Light Co. (St. Lucie Nuclear Power Plant, Unit 1), LBP-89-12, 29 NRC 441, 454-56, aff'd on other grounds, ALAB-921, 30 NRC 177 (1989). Moreover, according to the staff, in adopting section 50.68 in 1998, the agency endorsed the use of administrative controls relative to the criticality control measure of soluble boron credit (section 50.68(b)(2)-(4)). Finally, the staff rejects the BCOC assertion that the absence of human actions and administrative controls makes dry cask storage safer than SFP storage as beyond the scope of the contention and not reflective of the Commission's determination that both storage methods are safe.

d. Board Ruling. Although BCOC declares the language of GDC 62 to be clear, we find it considerably less than so in the context of this dispute. As the shifting debate

between the parties over the scope of the term "physical procedures or processes" illustrates, there is no clear cut demarcation to differentiate the administrative and nonadministrative aspects of the criticality control procedure/processes at issue here so as to place any of them either inside or outside this label.[5] As such, we think it appropriate to resort to the regulatory history of this provision to see what light, if any, it sheds on the question of whether the enrichment/burnup/boron solubility measures proposed by CP&L fall within the confines of those criticality control measures sanctioned by GDC 62. See Kansas Gas & Electric Co. (Wolf Creek Generating Station, Unit 1), CLI-99-19, 49 NRC 441, 456 (1999) (ambiguity in statutory language requires resort to legislative history).

CP&L and the staff have the better of the argument here. The critical item is the action of the AEC, the NRC's regulatory predecessor, in response to the comments of ORNL to the 1967 proposed rule version. At that juncture, the proposed GDC provided:

> Criticality in new and spent fuel storage shall be prevented by physical systems or processes. Such means as geometrically safe configurations shall be emphasized over procedural controls.

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[5] Indeed, the fact that none of the parties seems to be able to define a criticality control procedure that falls wholly inside of or outside of the realm either of the "physical" or the "administrative" strengthens our resolve on this point. See Tr. at 226-28, 261-62.

CP&L Summary, exh. 16A (32 Fed. Reg. 10,213, 10,217 (1967)). From this formulation, it is clear that with the term "physical systems or processes," the first sentence defines the scope of the appropriate methods of criticality control, while the second expresses the agency's preference among those methods, i.e., geometries over other controls. In response to this proposed rule, the Commission received a comment from ORNL that expressed uncertainty over the implications of the reference to "processes" at the end of the first sentence and declared that "nor do we believe that it is practical to depend upon procedural controls to prevent accidental criticality in storage facilities of power reactors." Id. exh. 17A (Sept. 6, 1967 Letter from William B. Cottrell, Director, ORNL Nuclear Safety information Center, to H.L. Price, AEC Director of Regulation, encl. at 11)). ORNL thus suggested that the last sentence be changed to read "'[s]uch means as geometrically safe configurations shall be used to insure that criticality cannot occur.'" Id. Albeit without discussion, the agency revised the final rule to its present configuration by incorporating the second suggestion, i.e., to indicate that geometric configuration is a preference, but without deleting the reference to "processes" or, it seems apparent, the administrative measures they encompass.

While this arguably is dispositive of the matter at issue in this portion of contention TC-2, we also agree with CP&L and the staff that further support for this conclusion comes from recent agency adoption of section 50.68 and the longstanding staff interpretation embodied in draft Regulatory Guide 1.13 and prior adjudicatory treatment of criticality-related matters. The language of section 50.68(b)(2), (4), (7) seems to contemplate the use of enrichment, burnup, and soluble boron as criticality control measures.[6] So too, the staff's nearly twenty-year old interpretation in the context of draft Regulatory Guide 1.13, albeit not dispositive, nonetheless reinforces our conclusion that this is the appropriate construction of this provision, see Petition for Emergency and Remedial Action, CLI-78-6, 7 NRC 400, 406-07 (1978), as do the adjudicatory decisions cited by the staff.

Finally, the "problem" cases discussed by BCOC in Appendix C to its written summary as evidence of the staff need to require an additional analysis are wholly inadequate

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[6] In connection with this provision, we note that section 50.68(b)(4) uses the term "maximum fuel assembly reactivity." Although it does not affect our determination regarding this provision, we note that "reactivity" is generally considered to be a property of the entire SFP rather than a individual fuel assembly. Individual assemblies are considered to have "reactivity worth," a value influenced by parameters such as original enrichment, burnup, irradiation history, element design, and pool position, that is imparted to the pool's reactivity value upon insertion.

as a basis for further adjudicatory proceedings relative to this concern. As CP&L correctly notes, the fuel mispositioning cases are not relevant to the Harris configuration and, as is apparent from the discussion of boron control measures in the affidavit of Mr. Stevens, see CP&L Summary, exh. 1, at 15-17, the boron dilution incident cited by BCOC has little relevance in the context of the Harris facility.[7]

In sum, in accordance with 10 C.F.R. § 2.1115(a), we conclude relative to this portion of contention TC-2 that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based upon the record before us, dispose of this portion of the contention as being resolved in favor of CP&L.

2. Basis Two

DISCUSSION: BCOC TC-2 Summary at 41-46; CP&L Summary at 55-74; Staff Summary at 26-29, 40-44; Tr. at 232-239, 245-46, 262-285, 292-304, 308-15, 318-24.

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[7] When questioned about the seeming lack of "significance" of these incidents, BCOC's response was to promise more information after further discovery. See Tr. at 242; see also Tr. at 439-41. Putting aside the fact that nothing in Subpart K suggests that additional discovery is available if an evidentiary hearing is found to be necessary, this response is not one likely to provide an impetus for the Board to convene such a hearing.

a. BCOC Position. BCOC has provided four interrelated arguments regarding basis two of contention TC-2. Among other things, the BCOC summary is supported by the affidavit of Dr. Gordon Thompson and Appendix C to its January 4, 2000 summary, discussed above, that describes some incidents it believes are relevant to the potential for criticality in spent fuel pools.

Relative to this portion of contention TC-2, BCOC first asserts that draft Regulatory Guide 1.13 calls for the analysis of situations under the double contingency principle involving "at least" two failures or violations of operating limits. According to BCOC, for an analysis to meet this requirement, it must identify the sets of failures or violations that might cause criticality, and then evaluate these failures or violations in combinations of at least two, to determine which combinations will cause criticality. This process will yield an envelope of criticality that bounds the combinations of failures and violations that produce criticality. BCOC states that such an envelope cannot be identified if failures or violations are evaluated one at a time. When the envelope has been identified, the DCP can be applied, with consideration as to whether the failures or violations are unlikely, independent, or concurrent. BCOC argues that CP&L has not gone through this process, but has only considered a single

failure, limited to the mispositioning of one fresh PWR fuel assembly.

BCOC also argues that, when the envelope of criticality has been determined for a particular situation, such as the storage of PWR fuel in Harris pools C and D, application of the DCP requires a determination, for each failure or violation represented in the envelope, about whether that failure or violation is unlikely, and whether it is independent of and concurrent with the other failures or violations represented in the envelope. BCOC believes that, for Harris pools C and D, the most significant failures or violations will be fuel mispositioning events and boron dilution events. BCOC asserts that CP&L has failed to determine if these events are unlikely, independent, or concurrent.

BCOC further declares that, in considering possible criticality accidents at Harris pools C and D, CP&L assumes that the mispositioning of fuel is an unlikely event, but CP&L offers no evidence to support this assumption. BCOC maintains that, as shown in Appendix B and discussed in Appendix C of its January 4, 2000 filing, experience shows that fuel mispositioning is likely. Moreover, BCOC believes that, in a criticality accident involving fuel mispositioning and soluble boron dilution, these events will typically be consecutive rather than concurrent.

High-reactivity fuel could be mispositioned in a fuel pool prior to or after a boron dilution event, or during both periods if an event sequence involving mispositioning of multiple fuel assemblies spans a time period during which boron dilution occurs. BCOC argues that, were CP&L to treat fuel mispositioning as a likely occurrence, then the criticality analysis would necessarily consider fuel mispositioning in combination with a complete absence of soluble boron. Indeed, BCOC asserts, this would be so even employing the allegedly invalid, nonconservative version of the DCP that is articulated in the so-called Kopp Memorandum, an August 19, 1998 memorandum providing guidance on regulatory requirements relating to SFP criticality analysis authored by staff witness Dr. Laurence Kopp, an NRC senior reactor engineer. Similarly, were CP&L to consider mispositioning and soluble boron dilution as consecutive occurrences, the criticality analysis would necessarily consider these occurrences in combination. BCOC states that calculations by CP&L and the staff, summarized in Appendix C to its January 2000 summary, show that mispositioning of a single fresh PWR fuel assembly in Harris pools C or D would, in the absence of soluble boron, cause the k-effective to exceed the regulatory limit of 0.95. Therefore, BCOC believes that mispositioning of more than one assembly could result in a potentially serious supercritical configuration.

In addition, BCOC maintains that, in considering the role of fuel mispositioning as a potential cause of criticality, CP&L has limited its attention to the mispositioning of only one PWR fuel assembly. Underlying this restriction is an assumption that a single failure or violation will lead to the mispositioning of only one fuel assembly. BCOC asserts that Appendices B and C to its January 2000 summary demonstrate that a single error can lead to the mispositioning of multiple fuel assemblies. BCOC thus claims that, in addition to its improper reliance on administrative measures for criticality control, CP&L's misapplication of the DCP in the manner discussed above has yielded a criticality analysis that is nonconservative and inadequate to provide reasonable assurance that public health and safety will be protected in the event of an accident.

To support this position, referencing the December 1998 CP&L license amendment application, the affidavit of staff witness Dr. Kopp, and an October 1983 American National Standards Institute (ANSI) Standard 57.2-1983, entitled "Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants," BCOC asserts that the K-effective value for SFP criticality must be less than 0.95, with a ninety-five percent probability at a ninety-five percent confidence level, under all conditions.

More specifically, BCOC asserts that this requirement of keeping K-effective below 0.95 applies even under the scenario in which a fresh fuel assembly is misplaced concurrent with the accidental loss of all soluble boron. BCOC thus maintains that all the analyses CP&L and the staff have performed and provided in their January 4, 2000 summaries only demonstrate that CP&L has not resolved the factual dispute as to whether a single misplaceed spent assembly would result in criticality above acceptable levels under applicable NRC and industry standards.

b. CP&L Position. CP&L's supports its January 4, 2000 summary on this matter with the affidavits of Dr. Everett L. Redmond II, a nuclear engineer with Holtec International with responsibility for performing nuclear criticality analyses for spent fuel storage systems, and Michael J. DeVoe, a CP&L nuclear engineer responsible for performing the CP&L review of the nuclear criticality analyses for Harris spent fuel pools C and D. Regarding this portion of the contention, CP&L first asserts that basis two raises a question of fact, i.e., will a single misplaced fuel assembly, involving a fuel element of the wrong burnup or enrichment, cause criticality in Harris SFPs C and D. According to CP&L, disposition of this question requires the resolution of two additional queries: (1) did CP&L perform a criticality analysis of a single fuel

assembly misplacement, involving a fresh fuel assembly with the maximum permissible reactivity at Harris, for the spent fuel storage racks in Harris pool C and D; and (2) does that criticality analysis demonstrate that a single fuel assembly misplacement, involving a fresh fuel assembly with the maximum permissible reactivity at Harris, will not cause criticality in Harris pools C and D. CP&L claims the Board should dispose of basis two in its favor because these two questions can be answered in the affirmative.

CP&L declares that following the admission of basis two, it performed an analysis to evaluate the misplacement of a single fuel assembly in the spent fuel storage racks for Harris SFPs C and D. The results of this analysis are documented in Holtec Report No. HI-992283, Evaluation of Fresh Fuel Assembly Misload in Harris Pools C and D (rev. O Sept. 20, 1999), which CP&L refers to as the Harris Misplacement Analysis. The analysis, performed by Dr. Redmond, evaluates a fuel assembly misplacement specifically for the spent fuel storage racks for Harris pools C and D using the specific fuel assembly characteristics and spent fuel storage rack designs for Harris spent pools C and D. The analysis uses the same methodology, including the assumptions and modeling of the storage rack design and fuel assembly characteristics, as was developed for -- and used in -- the so-called Harris Base Criticality Analysis that

was generated initially for the CP&L license amendment application.

According to CP&L, the misplacement analysis evaluates a single fresh fuel assembly mispositioning of the maximum permissible enrichment for Harris in a spent fuel storage rack that is otherwise loaded with fuel of the maximum permissible reactivity allowable under the burnup and enrichment curve. A maximum reactivity fresh fuel assembly for Harris would be a Westinghouse 15x15 PWR fuel assembly enriched to five percent (by weight) uranium-235. The analysis considered the presence of 2000 parts per million (ppm) of soluble boron in the pool water, as required by Harris operating procedures. Furthermore, the analysis also evaluates criticality safety for two additional boron concentrations: (a) 400 ppm of soluble boron to confirm CP&L statements in its June 14, 1999 response to a staff requests for additional information (RAI); and (b) zero ppm of soluble boron. While not considered a credible scenario, CP&L states this analysis for zero boron concentration was performed to render moot any further discussion of the loss of soluble boron relative to this issue.

CP&L asserts that the results of this analysis demonstrate that a single fuel assembly misplacement, involving a fuel element of the wrong burnup or enrichment, will not cause criticality in Harris spent fuel pools

C and D.[8] The analysis demonstrates that the spent fuel in the storage racks, with the required 2000 ppm of soluble boron in the SFP water, will remain subcritical at a k-effective of 0.7783 following the misplacement of a fresh fuel assembly with the maximum permissible enrichment at Harris. The analysis also demonstrates that the spent fuel in the storage racks will remain subcritical, with a K-effective of 0.9352, following a misplacement event assuming only 400 ppm of soluble boron is present in the SFP water. Finally, CP&L claims the analysis demonstrates that the spent fuel in the storage racks for Harris pools C and D will remain subcritical following a fresh fuel assembly misplacement event even if no soluble boron is present in the spent fuel pool water, with a K-effective of 0.9932.

CP&L states that these results affirmatively demonstrate that (1) CP&L has performed a criticality analysis of a single fuel assembly misplacement, involving a fresh fuel assembly with the maximum permissible reactivity at Harris, for the spent fuel storage racks in Harris pools C and D; and (2) the criticality analysis demonstrates that

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[8] CP&L states that the methodology, assumptions, and results of the Harris Misplacement Analysis were reviewed and approved under the quality assurance requirements of both Holtec and CP&L. CP&L argues that these quality assurance reviews of the analysis by qualified nuclear criticality analysts provide reasonable assurance that the analysis results are valid. It also notes that Dr. Thompson, as BCOC's expert, did not challenge the validity of the analysis.

a single fuel assembly misplacement, involving a fresh fuel assembly fuel element with maximum permissible reactivity at Harris, will not cause criticality in Harris pools C and D. CP&L concludes that because the two questions it posed have been answered affirmatively, and BCOC does not dispute those answers, the Board should dispose of basis two of contention TC-2 in its favor.

Additionally, CP&L makes the following observations to bolster its argument that the likelihood of misplacement of single fuel assembly is very small: (1) fresh fuel assemblies are first handled dry, in open air, and only then are positioned in pool A, which is located near Harris Unit 1 some distance from SPFs C and D; (2) due to financial considerations, there are usually only fifty-seven fresh assemblies on-site at anytime; (3) proposed Harris technical specifications will prohibit loading of fresh fuel assemblies in pools C and D; and (4) information on fresh fuel movements is independently verified through two sources and is also tracked in a QA computer database.

CP&L also disputes BCOC's assertions that K-effective should be kept below 0.95 for all conditions according to applicable NRC and industry standards. CP&L asserts that 10 C.F.R. § 50.68(b)(4) should be the ultimate guidance on this subject and it permits a K-effective value above 0.95 (at a ninety-five percent probability, ninety-five percent

confidence level), as long as it remains below 1.0, when credit is taken for soluble boron and when the spent fuel pool is accidentally flooded with pure water.

Finally, CP&L asserts that several new issues were raised by BCOC that should be dismissed. As has already been discussed, even though CP&L believes the first issue -- the need for an evaluation of the loss of all soluble boron in the pool water concurrent with a fuel assembly misplacement -- is not required under NRC regulations, it notes it has performed an analysis that demonstrates the spent fuel storage racks for Harris pools C and D will remain subcritical (K-effective of 0.9932) for this scenario. CP&L maintains this issue is resolved.

The same is true for the second issue -- need to evaluate the concurrent misplacement of multiple fuel assemblies. While maintaining such a study is not required under NRC regulations, CP&L cites the results of a November 1999 staff analysis demonstrating that, at a boron concentration of 2000 ppm, the spent fuel storage racks for Harris SFPs C and D will remain subcritical (K-effective of 0.98) when the storage racks are filled entirely with misloaded fresh fuel assemblies. Therefore CP&L maintains this issue is now resolved as well.

The third new issue -- the need to analyze the universe of scenarios involving two or more unlikely, independent, or

concurrent events -- also is without substance according to CP&L. CP&L asserts that, as with first two new issues, BCOC's requested analysis is not required under the DCP. Moreover, according to CP&L, in light of the criticality analyses CP&L and the staff have already performed, BCOC has admitted that the only scenario missing from its "universe" of scenarios of two or more failures is multiple fuel assembly misplacement. Thus, BCOC's narrowing of the remaining universe of scenarios down to multiple fuel assembly misplacement renders the third new issue, as a practical matter, identical to the second issue, which the staff's additional criticality analysis renders moot by demonstrating that the spent fuel storage racks for Harris SFPs C and D will remain subcritical following a misplacement that involves all fresh fuel assemblies.

c. Staff Position. The staff's January 4, 2000 summary is supported by the affidavits of Dr. Kopp and NRC nuclear engineer Anthony P. Ulses. In general the staff agrees with CP&L that there is no genuine and substantial factual dispute relating to basis two of contention TC-2.

According to the staff, it has reviewed the criticality calculations performed by CP&L, including the Harris Misplacement Analysis, and found them adequate. The staff notes that Holtec International, which performed the CP&L analysis of reactivity effects for the proposed use of

Harris pools C and D, analyzed reactivity effects of fuel storage in the Harris spent fuel racks using CASMO-3, which is a two-dimensional transport theory code. Holtec also used CASMO-3 for burnup calculations and for evaluating small reactivity increments associated with manufacturing tolerances. On the other hand, Holtec used the MCNP-4A Monte Carlo code to determine reactivity effects, to calculate the reactivity for fuel misloading outside the racks, and to determine the effect of having PWR and BWR racks adjacent to each other. Holtec also used MCNP-4A for independent verification calculations against CASMO-3.

According to the staff, the CASMO-3 and MCNP-4A codes are widely used for analyzing fuel rack reactivity and have been benchmarked (i.e., compared to known values to evaluate their predictions) against results from numerous criticality experiments. The staff declares that these individual analysis methods, which attempt to simulate the Harris spent fuel racks as realistically as possible for important parameters such as enrichment, assembly spacing, and absorber thickness, showed good agreement with each other. The staff also maintains that comparison of different analytical methods is an acceptable technique for validating calculational methods for nuclear criticality safety. Moreover, these methods have been used and approved by the staff in numerous other SFP criticality analyses.

Like CP&L, the staff indicated it considers a fuel assembly misplacement unlikely, citing several reasons that generally agree with the CP&L arguments. First, the staff notes that proposed Technical Specification 5.6.1.2 will control fuel storage limitations, and Harris selection procedure NFP-NGGC-0003 will be in place to control fuel assembly selection and avoid mispositioning errors. The staff also observes that fresh fuel assemblies have a bright metallic color and are distinguishable from spent fuel assemblies, which have a darker, reddish color due to oxidation of the cladding, thereby providing a visual distinction that will help avoid misplacement errors. Third, the staff notes that the proposed burnup limit curve is conservatively based on a minimum required burnup. Accordingly, unless a fuel assembly is prematurely discharged from the reactor, it will have a higher burnup than the burnup requirements and, therefore, a lower reactivity.

Also like CP&L, the staff considers boron dilution events in pools C or D unlikely. Initially, the staff argues that Harris Chemistry and Radiochemistry Procedure CRC-001 requires that boron concentration be kept at between 2000 and 2600 ppm, and that confirmation be done by monthly surveillance. Further, according to the staff, Harris technical specification 3.9.11 requires a minimum of

twenty-three feet of water above the top of the fuel rods, which provides adequate margins against water leakage or overfill. Further, in place to avoid boron dilution incidents are high and low water level alarms at the pools, as indicated by the section 9.1.3 of the Harris final safety analysis report (FSAR). Finally, the staff notes that a visual inspection of SFP water is done during each Harris operating shift.

Also significant, according to the staff, is the November 1999 independent analysis it performed to assess the impact of misloading spent fuel pools C and D entirely with fresh fuel assemblies. For purposes of this analysis, the staff assumed that soluble boron concentration was 2000 ppm, the pool water temperature was four degrees Celsius, and there would be the worst conceivable misloading, consisting of Westinghouse 15 x 15 assemblies enriched to five percent U-235 without burnable poisons, which would be bounding as the highest allowed enrichment for commercial power reactor fuel. The staff further states that it modeled the rack, fuel, and poison plate geometry using their nominal dimensions.

The staff declares that it used the SCALE code system to perform the analysis, which it claims without dispute from BCOC has been validated for these types of calculations. According to the staff, it further assumed

that the storage racks were filled entirely with misloaded assemblies. The staff asserts that such misloading, which could result only from multiple unlikely events requiring multiple errors, results in a predicted maximum k-effective of 0.98. The staff concludes that because this configuration, which represents the worst possible series of misloading events, resulted in a k-effective of less than 1.0, the misloading of an entire rack of fresh fuel in spent fuel pools C or D will not lead to criticality.

d. Board Ruling.[9] The Board observed that basis two of contention TC-2 raised the following question of fact:

> Will a single fuel assembly misplacement, involving a fuel element of the wrong burnup or enrichment, cause criticality in the fuel pool, or would

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[9] BCOC proffered Dr. Gordon Thompson as its expert witness for this contention. Citing various agency precedents regarding the qualifications of expert witnesses, the staff maintains that Dr. Thompson does not qualify as an expert witness by virtue of his knowledge, skill, experience, training, or education. According to the staff, because Dr. Thompson is no more qualified to render an expert technical opinion on criticality than any layperson, any conclusions he makes, opinions he renders, or other testimony related to this contention should be stricken. See Staff Summary at 14-19.

After hearing party presentations regarding this objection during the January 21, 2000 oral argument, see Tr. at 207-18, the Board ruled from the bench that it would not declare Dr. Thompson ineligible to be the BCOC expert on this matter, but would assign his testimony appropriate weight commensurate with his expertise and qualifications, id. at 441. In this regard, we note that by reason of his experience and training, his expertise relative to reactor technical issues seems largely policy-oriented rather than operational.

> more than one such misplacement or a misplacement coupled with some other error be needed to cause such criticality?

LBP-99-25, 50 NRC at 36. BCOC has suggested that, in making this statement, we misspoke relative to the DCP. In this regard, we note that as the basis for its contention, after quoting the DPC provision of draft Regulatory Guide 1.13, BCOC stated:

> CP&L's proposed administrative controls on criticality would not satisfy this requirement because only one failure or violation, namely placement in the racks of PWR fuel not within the "acceptable range" of burnup, could cause criticality.

[BCOC] Supplemental Petition to Intervene (Apr. 5, 1999) at 13. Relative to BCOC's concern, although we believe our statement is a fair characterization of its position at that time, we will not, as CP&L and the staff suggest, reject any consideration of a multiple fuel misplacement scenario.

Be that as it may, the Board finds that the analyses performed by CP&L and the staff have adequately answered the question posed by this portion of the contention, namely, would fuel assembly misplacement, involving fuel assemblies with the maximum permissible enrichment, cause SFP criticality. Specifically, the CP&L SFPs C and D criticality calculations involving the misplacement of a fresh fuel assembly with the maximum permissible reactivity, the technical details and computational accuracy of which

BCOC has not contested, demonstrate that with respective K-effectives of 0.7783 and 0.9352, the pools would not go critical when the boron concentration in the water is at the required minimum level of 2,000 ppm or at a significantly lower level of 400 ppm. Moreover, as the study demonstrates, this is true even if there were no boron in the spent fuel pools, which produces a K-effective of 0.9932. This clearly provides an upper bound for the criticality analyses of misplacement of a single fuel assembly concurrent with an accidental loss of some or all of the SFP's soluble boron.

The staff also performed a further independent analysis that shows that, with boron at the minimum required level, even misplacing all fuel assemblies in the pool would cause a K-effective of 0.98, which would not cause spent fuel pools C or D to go critical. Again, BCOC has not disputed the technical details and computational adequacy of the staff's calculations for this postulated scenario.

BCOC did advance a theory in its oral argument that K-effective must be kept at or below 0.95 under all conditions, including the scenario in which a fresh fuel assembly is misplaced concurrent with an accidental loss of all soluble boron. Such a theory is meritless, however, in the face of 10 C.F.R. § 50.68(b)(4), which states in pertinent part:

> If credit is taken for soluble boron, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water.

The intent of this requirement is unambiguous. K-effective must be kept at 0.95 or below when credit for soluble boron is taken; if, however, there is the accidental loss of boron, the SFP still cannot go critical, i.e., it must remain below a K-effective of 1.0. Thus, there is no requirement that K-effective must be kept at or below 0.95 under all conditions, including the scenario involving a fresh fuel assembly misplacement concurrent with the loss of soluble boron.

Additionally, though they are not central to the resolution of basis two, the Board also finds credible (a) the evaluation proffered by CP&L and the staff indicating a low likelihood of a fresh fuel assembly misplacement in SFPs C and D; and (b) the evaluation provided by CP&L and the staff indicating a small probability that boron dilution will occur in spent fuel pools C or D. Supporting our conclusion relative to item (a) above, is the combination of (1) measures involving technical specifications requirements and procedural controls; (2) the use of independent

verification for fuel movement; and (3) the visual differentiation of spent fuel and fresh fuel assemblies, all of which lead to a low likelihood of misplacing a fresh fuel assembly. And for item (b) above, based on (1) the technical specification requirements and procedural controls regarding SFP boron concentration; (2) the margins inherent in the twenty-three feet of water above the fuel assemblies; (3) the existence of high and low water level alarms; and (4) the visual checks during each shift of operation, the Board similarly is satisfied that the probability of a boron dilution event is small.

Finally, relative to the "new" issues raised by BCOC during discovery as delineated by CP&L in its January 4, 2000 filing and addressed in detail by both CP&L and BCOC during the January 21, 2000 oral argument, involving (a) the loss of all soluble boron concurrent with the misplacement of a fuel assembly; (b) concurrent misplacement of multiple fuel assemblies; and (c) the analysis of scenarios of two or more unlikely, independent, concurrent events, we find that each has been adequately resolved or rendered moot by the analyses performed by CP&L and the staff.

As a consequence, in accordance with 10 C.F.R. § 2.1115(a), we find relative to this portion of contention TC-2 that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient

accuracy by the introduction of evidence in an evidentiary hearing. As such, based on the record before us, we dispose of this portion of the contention as being resolved in favor of CP&L.

B. Contention TC-3

The substance of Contention TC-3 consists of disputes over five matters:

1. What equipment within the spent fuel pool cooling and cleanup system (SFPCCS) and the component cooling water system (CCWS) is covered relative to BCOC's quality assurance concerns?

2. Whether the proposed activation of equipment complies with the requirements of 10 C.F.R. Part 50, Appendix B?

3. Whether the CP&L proposed Alternative Plan is adequate to meet the requirements of 10 C.F.R. § 50.55a(a)(3)?

4. What are the consequences of a failure of the equipment covered?

5. Does the nature of the proposed change to the facility require that a construction permit be issued?

We treat each issue below.

1. Scope of the Equipment Covered by the Contention

DISCUSSION: CP&L Summary at 76-77; Staff Summary at 49-50; Tr. at 325-26, 346-47, 382.

a. Parties' Positions. In its January 4, 2000 written statement, referencing the deposition of Union of Concerned Scientists nuclear safety engineer and BCOC supporting expert David Lochbaum, the staff noted Mr.

Lochbaum's agreement that the only equipment issues in contention were the fifteen welds in the piping embedded in concrete so as not to be subject to inspection from the outside. CP&L likewise noted that Mr. Lochbaum had "conceded that the SFPCCS heat exchangers, pumps, and accessible piping . . . are not at issue in Contention [TC-]3." CP&L Summary at 76. BCOC had not addressed this matter directly in its written statement; however, at the January 21, 2000 oral argument BCOC asserted that "the scope of the equipment that has not been kept in an appropriate lay-up condition at Harris over the last 15 or so years is broader than the scope of equipment as defined in [BCOC]'s contention." Tr. at 325. BCOC also argued "that, in fact, other equipment was not kept in an appropriately laid-up condition" and asserted that "we are planning to file a request for an amendment of the contention to seek restoration of that part of the contention that was dropped." Id. at 326.

b. Board Ruling.[10] BCOC has not filed a request to amend its contention to seek to further define the scope of equipment covered. Accordingly, in light of the statements of BCOC witness Mr. Lochbaum, the Board limits its consideration of this contention to the condition of the fifteen welds and associated piping that are inaccessible because they are embedded in concrete.

Thus, in accordance with 10 C.F.R. § 2.1115(a), we find relative to this portion of contention TC-3 that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based on the record before us, dispose of this portion of the contention as being resolved in favor of CP&L.

2. Compliance with 10 C.F.R. Part 50, Appendix B.

DISCUSSION: Detailed Summary of Facts, Data and Arguments and Sworn Submission on Which [BCOC] Intends to

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[10] As with Dr. Thompson, see supra note 9, the staff initially sought to disqualify Mr. Lochbaum as an expert witness and have his testimony relative to contention TC-3 stricken or limited. See Staff Summary at 65-66. At the oral argument, however, the staff amended its motion to request that the Board assign his testimony appropriate weight commensurate with his expertise and qualifications, Tr. at 393-95. We do so here, noting that in this context his qualifications appear to run to facility procedures and operations, e.g., whether a particular procedure to detect microbiologically induced corrosion (MIC) was properly utilized, rather than substantive knowledge of the underlying technical subject involved with the procedure, e.g., whether a claimed piping defect was MIC. See Tr. at 334.

Reply at Oral Argument to Demonstrate the Existence of a Genuine and Substantial Dispute of Fact with [CP&L] Regarding the Proposed Expansion of Spent Fuel Storage Capacity at the Harris Nuclear Power Plant With Respect to Quality Assurance Issues (Contention TC-3) (Jan. 4, 2000) at 16-24 [hereinafter BCOC TC-3 Summary]; Staff Summary at 51-53; Tr. at 330-32, 356-58, 396-97.

a. Parties' Positions. As we noted in section I.B above, this contention challenges CP&L's compliance with the requirements of 10 C.F.R. Part 50, App. B, the Commission's quality assurance regulation, and in particular its adherence to Criteria XIII, XVI, and XVII governing, respectively, storage and preservation of equipment, measures to correct damage or deterioration, and record keeping. Indeed, in admitting the contention the Board stated:

> It is also clear from the positions of all the participants that some of the piping and equipment have not been properly stored and proper records regarding its quality during that period have not been maintained. Whether such storage and maintenance are necessary as a matter of law and fact is clearly a subject of dispute among the participants. The argument concerning this point is not a simple one.

LBP-99-02, 50 NRC at 37.

The staff argues that the requirements of Appendix B only apply during construction and operation and that, in

effect, since the Harris construction permit expired and the SFPCCS for pools C and D was never part of an operating plant "CP&L does not have to demonstrate compliance with Appendix B during the lay-up period." Staff Summary at 52. CP&L takes the same position, namely that at the time Harris Unit 2 construction was abandoned, the piping and welds were no longer under construction, were not in operation, and had no safety-related function. As a consequence, CP&L maintains, by its own terms Appendix B did not apply during the post-abandonment period. CP&L and the staff thus would have us find that the lack of compliance with Appendix B during the lay-up period is of no consequence. Instead, in their view, all that matters is whether CP&L's Alternative Plan, submitted under 10 C.F.R. § 50.55a(a)(3) as offering an alternative to the code requirements therein, is sufficient to provide an acceptable level of quality and safety.

In contrast, BCOC maintains that CP&L's preparation of an alternative plan to conform to the requirements of section 50.55a simply goes to the question of the pedigree of the piping, i.e., to compensate for the fact that the original quality assurance documentation has been lost in a number of instances. It does not, however, excuse CP&L from a showing of compliance with the terms of Appendix B for that piping during the period of abandonment.

b. Board Ruling. In the Board's view, in the context of this amendment request, the evident purpose of both regulatory provisions is so closely parallel that we can regard compliance with section 50.55a as affording compliance with Appendix B. If the CP&L Alternative Program complies with section 50.55a, it is acceptable under Appendix B as well.

We thus will proceed to analyze the extent to which the CP&L Alternative Plan represents a proper alternative under the requirements of section 50.55a, confident that if its coverage is appropriate, compliance with Appendix B will have been achieved.[11]

Pursuant to 10 C.F.R. § 2.1115(b), we find relative to this portion of contention TC-3 that there is no genuine and

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[11] Relative to the specifics of compliance with 10 C.F.R. Part 50, App. B., BCOC argues that CP&L has failed to meet Criterion XIII, requiring measures to control handling, shipping, and storage. See BCOC TC-3 Summary at 16-19. We note, however, that a substantial portion of the Alternative Plan is devoted to showing that deterioration did not occur during the lay up period as a substitute for this requirement, and BCOC presents no expert testimony showing why the Alternative Plan has not demonstrated adequate evidence of this equivalence. Similarly, BCOC alleges that appropriate corrective actions have not been taken in accord with Criterion XVI of Appendix B, but presents no expert testimony as to what corrective actions are necessary. See id. at 20-23. BCOC further states that the Alternative Plan does not describe what criteria are to be used in inspecting piping and welds, and that the reader of the Alternative Plan "reasonably presumes that the criteria must relate to the piping pedigree, not to its condition." Id. at 22. In fact, the BCOC summary subsequently cites such criteria. See id. at 41.

substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based on the record before us, dispose of this portion of the contention as being resolved in favor of CP&L.

3. Adequacy of the Alternative Plan to Meet the Requirements of 10 C.F.R. § 50.55a(a)(3)

DISCUSSION: BCOC TC-3 Summary at 24-51; CP&L Summary at 78-89; Staff Summary at 55-65; Tr. at 339-43, 360-75, 397-405.

a. BCOC Position. BCOC's attack on the CP&L amendment request under this portion of contention TC-3 centers on both the notion that CP&L has only a "snapshot" of the conditions under which storage took place and what BCOC describes as the staff's "Sleeping Beauty" notion, i.e., that the "CP&L went to sleep for 15 years" and that, once it awakened from its slumber, it was as if all those years had never passed relative to the piping systems at issue. Tr. at 329. With Mr. Lochbaum as its supporting witness, BCOC challenges the crux of the CP&L and staff reasoning that a combination of construction period QA (to the extent that QA can now be verified) and present day inspection and testing of the interior of the piping at issue can serve as a substitute for a QA program carried out with continuity throughout the construction and operation of the equipment at bar. In this regard, BCOC questions

whether the construction period QA can be proven adequate absent certain construction era documentation and whether the current inspection of the embedded welds is complete and sufficient.

b. CP&L Position. CP&L observes that "[t]he 50.55a Alternative Plan addresses the existing situation where [the Harris facility] is no longer under construction, CP&L no longer maintains its ASME N-Stamp certification program, and certain quality documentation was discarded concerning field welds." CP&L Summary at 78. Further, CP&L asserts that "BCOC has not challenged the adequacy of the Supplemental QA requirements as an alternative to ASME N-Stamp certification." Id. at 79.[12]

Accordingly, at the outset, CP&L's position is that "[t]he acceptability of the embedded welds in 1983 . . . has been demonstrated by the implementation of the 'Piping Pedigree Plan.'" Id. at 81. To buttress this position, CP&L offers the affidavits of CP&L spent fuel project manager Edwards, and of CP&L employees David L. Shockley,

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[12] In a footnote to that statement, CP&L asserts that the only facts that BCOC presents attacking the Harris facility QA program for the construction period are four NRC inspection reports from 1981, which are mentioned by Mr. Lochbaum in his affidavit. CP&L points out, however, that in his deposition, Mr. Lochbaum asserted that the minor infractions that these reports addressed "wouldn't lead me to believe that the quality assurance program at Shearon Harris was deficient or had a programmatic breakdown." CP&L Summary at 79 n.202 (quoting id., exh. 10, at 129-30 (Lochbaum Deposition (Oct. 24, 1999))).

Charles H. Griffith, and William T. Gilbert. The latter three affiants, who worked at the Harris plant during the construction period and attest to familiarity with quality assurance matters relating to the embedded piping and associated welding at issue, assert that the procedures in effect during construction made certain that the fifteen welds in question were, in fact completed in accordance with the QA program then in effect. They base their conclusions on procedures in effect at the time that required certain inspections to be completed before concrete pours and hydrostatic tests, signatures of authorized nuclear inspectors, and on the presence of their own signatures on certain documents from the construction period. Mr. Edwards states that current walkdowns and inspections, when combined with reviews of available documentation and interviews with personnel who were part of the process provide reasonable assurance that the fifteen welds in question were completed according to QA requirements.

CP&L also contends, however, that the test and inspection procedures it has recently performed, the so-called Equipment Commissioning Plan, complete the QA cycle in a manner sufficient to meet the "acceptable level of quality and safety" criterion of 10 C.F.R. § 50.55a(a)(3)(ii). In support of this position, CP&L references the affidavits of Mr. Edwards and Mr. Griffin, as

well as the affidavits of CP&L senior engineer and corrosion scientist Dr. Ahmad A. Moccari and Structural Integrity Associates, Inc., (SIA) metallurgical engineer George J. Licina, who describe different aspects of the recent CP&L efforts to ascertain the quality of the embedded piping and the associated welds, including sampling of water in the pipes and video camera inspection of the condition of the interior of the pipes.

Further, relative to the sufficiency of the embedded piping and welds, CP&L also notes that the installation of all four fuel pools was completed at the same time and by the same team of construction personnel, welders, and inspectors; that the work was done at all four pools in accordance with the same ASME code; and that spent fuel pools A and B have operated without incident since startup of Unit 1. CP&L maintains that these items, in combination with the information provided by the affiants, are sufficient to establish compliance with the requirements of section 50.55a(a)(3).

c. Staff Position. The staff finds the Alternative Plan adequate. According to the staff, BCOC has not shown any legitimate, substantial issues about the quality of the original construction, and the Alternative Plan presents an alternative to the section 50.55a ASME Code requirements sufficient to demonstrate that the welds and piping are

acceptable for service. Referencing the affidavits of Mr. Heck and Mr. Naujock, the staff outlines the results of its review process regarding existing construction records. Mr. Heck asserts that the sequential QA requirements and signatures of QA personnel at various hold points in the process, such as hydrostatic testing and concrete placement, give confidence that all welds were done in compliance with ASME and other QA requirements, concluding "the subject welds were completed with an acceptable level of quality and safety." Staff Summary, Affidavit of Kenneth C. Heck in Support of NRC Staff's Written Summary (Jan. 10, 2000) at 27. The staff's affiant Naujock also concludes that the welds made on SFPs C and D piping "were made by qualified personnel using qualified procedures in accordance with the objectives of [ASME Code] Section III requirements." Id. Affidavit of Donald G. Naujock in Support of Brief and Summary of Relevant Facts, Data and Arguments upon Which the Staff Proposes to Rely at Oral Argument on Technical Contention 3 (Jan. 4, 2000) at 9. Moreover, relative to the current state of the embedded piping and welds, citing the affidavits of Mr. Naujock and Dr. Davis, the staff declares that its review of the procedures used for and the results of the CP&L video inspection process led it to conclude that "a sufficient basis exists to state with reasonable assurance that the welds were completed with an acceptable

level of quality and safety and no degradation of the welds and pipes occurred during the layup [period]." Staff Summary at 65. Finally, like CP&L, the staff notes that the Unit 1 fuel pools have supported Unit 1 operation since startup without "significant problems." Id. at 63.

d. Board Ruling. This issue lies at the heart of contention TC-3. While it may be true that BCOC has not directly assailed the Alternative Plan, it is clear that BCOC does dispute its adequacy. Yet, despite its objections, BCOC presents no real evidence that the absence of certain weld documentation would suggest that the welds were not completed in accordance with appropriate QA requirements. Instead, BCOC's evidence consists largely of its own review of CP&L and staff documentation regarding activities relating to SFPs C and D. Indeed, BCOC's chief witness in support of this contention,[13] David Lochbaum, at his October 1999 deposition agreed that the only facts he could put forth were those gleaned from his perusal of discovery material supplied by the staff and CPL. Moreover, we see no indication that Mr. Lochbaum's review of the documentation on the welds suggests that any of the missing weld data could be indicative of specific flaws in the

[13] While the caption of his declaration in support of BCOC specifies contention TC-2, the body of the declaration addresses contention TC-3. Because Mr. Lochbaum was put forth by BCOC only as a witness for contention TC-3, the Board assumes the caption contains a typographical error.

original construction, nor does it seem that he has any independent knowledge of such flaws.

Thus, on the matter of the adequacy of the original construction, the record before us fully supports the conclusion that the piping and associated welds at issue were completed in accordance with the agency QA regulations and applicable ASME code requirements.

This brings us to the question embodied in BCOC's "snapshot" and "Sleeping Beauty" allegations: Will the assurance that the original QA program was adequate, when coupled with the present day procedures and tests embodied in the Alternative Plan, give assurance that the present piping/weld quality is adequate, despite the long period when the equipment was not subject to storage and inspection conditions that were strictly in accordance with QA procedures.

CP&L's positions that the fuel pool piping was built to agency QA and ASME Code requirements and that the contention at bar relates only to the fifteen welds and associated piping that are inaccessible because they are embedded in concrete. Bearing in mind these findings, to answer the question posed above we must review the adequacy of the current tests and procedures relating the embedded material. In this regard, CP&L points out that "[t]he tests and inspections included testing of the water in the SFPCCS

piping, a complete walk-down and visual inspection of all accessible piping, welds, components and equipment, re-inspection of all accessible welds, testing the weld filler material in the accessible welds" and inspection of the surface of the spent fuel pool walls and concrete in which the piping is embedded to detect any evidence of outside chemical attack to the external surface of the piping. CP&L Summary at 93.

Looking to these activities, several points stand out. Regarding the water that has been in the SFPCCS during the layup period, it was analyzed by Harris chemists for chemical content and by Dr. Ahmad Moccari for microbiological content. The water turned out to be of high purity and did not contain any bacteria capable of causing microbiologically induced corrosion (MIC). The results of this testing indicated a highly unlikely potential for chemically or microbiologically induced corrosion according to CP&L's expert on corrosion, Dr. Ahmad Moccari. See CP&L Summary at 93-94.

Additionally, all fifteen embedded welds and their associated piping were inspected using a high resolution camera, taking high quality pictures of everything inside the piping, longitudinal welds, circumferential welds, and piping surfaces. See id. at 94-95. Some general discoloration of welds and piping was noted. Reddish brown

deposits were observed on welds and piping, as were shallow indications on a weld and seam, and incomplete melting of some consumable inserts. See id. at 95-96. Samples of the reddish brown deposits were taken and the remaining deposits were removed with high pressure water and the surface reinspected. While Mr. Licina noted what appeared to be two small pits under the deposit, both he and Dr. Moccari agreed that these pits would have no impact on the integrity of the piping. See id. at 96. The deposit material was analyzed with a scanning electronic microscope and found to consist of iron oxide, similar in appearance to that introduced into the spent fuel pool water during the transshipment of fuel from other CP&L plants. The material, however, neither results from, contributes to, nor is otherwise associated with corrosion or degradation of the piping. See id. at 97. The deposits simply represent places at which crud accumulated. See id. at 98. The incomplete melting of the consumable inserts was not viewed by CP&L's experts as cause for concern. See id. at 99-100.

The largest of the shallow indications mentioned above was about one-half inch long. Since the chemical and temperature conditions are not aggressive and the line was not exposed to thermal or loading cycling, the specific cause of this indication could not be determined. See id. at 101-02. However, CP&L's contractor SIA independently

evaluated the implication of such indications for the structural integrity of the piping and concluded that they did not pose any challenge to that integrity or to the piping's suitability for service. See id. at 102.

The staff has also evaluated CP&L's Alternative Plan, the analyses and examinations it calls for, and the environment and present condition of the embedded pipes and welds. See Staff Summary at 63. The staff's evaluation was conducted by Mr. Naujock and Dr. Davis, whose affidavits are proffered as a foundation for the conclusion that "the welds and piping are acceptable for service and that the Alternative Plan provides an[] acceptable level of quality and safety." Id. at 65. A significant element in this conclusion, it seems apparent, was the CP&L summer 1999 visual inspection of the interior surface of the embedded welds using a high resolution remote camera capable of detecting a one mil diameter wire and demonstrated to be capable of detecting small flaws consistent with ASME Code requirements. The staff notes that enhanced visual inspection has been approved in previous cases for reactor vessel internals. See id. at 63-64.

Staff expert Lr. Davis reviewed the video tapes resulting from the remote camera examinations of ten of the fifteen embedded welds and observed no evidence of MIC, no degradation of the welds, and nothing that required

corrective action. This staff expert noted that five of the welds required further evaluation and that these welds were analyzed by SIA. From the review and analysis of the video tapes, and from the available documentation, the staff concluded that the piping and welds are conservatively designed; are several times thicker than required by ASME Code; are generally in good condition with some minor, but no major, defects; and have leak tight integrity. The staff also concluded that there were no viable mechanisms for longitudinal cracking such as intergranular stress corrosion cracking, transgranular stress corrosion cracking, or localized corrosion. The only mechanism the staff could find viable for corrosion was MIC, and the water sampling and sampling of deposits on one weld produced no evidence of that. Further, no leaks consistent with MIC were observed on any of the accessible piping. The staff thus determined that the welds were completed with an acceptable level of quality and safety and that no degradation of the welds and pipes occurred during the lay up period. See id. at 64-65.

For its part, BCOC would have us find that the video tapes revealed evidence of degradation and that evidence was not adequately investigated. See BCOC TC-3 Summary at 4. In this regard, BCOC relies on a deposition statement by its expert witness, Mr. Lochbaum, concerning certain details from the remote camera video tapes for the proposition that

there were "shop welds" present in addition to the "field welds" and that fact represents some sort of deficiency in the entire procedure. See id. at 44-45. BCOC argues that a shop weld was discovered by accident, and that only that one weld and none of the many other shop welds were examined. Id. At oral argument, CP&L pointed out that the remark cited by Mr. Lochbaum was, later in the video tape, found to pertain to a field weld, and that the camera operator, who was not an expert in interpreting the results, was not criticizing the condition of the weld but was simply making an irrelevant remark because of a mistake in the position of the camera. Further, staff witness Dr. Davis and CP&L witness Mr. Edwards examined the weld in question and found no fault with it. See Tr. at 368-69. And, in addressing this point, CP&L also declared that the pedigree of every shop weld was available (because, of course, that pedigree had been established at the fabricator's plant and was not part of the documentation discarded after suspension of construction). And shop welds are, in any event, less susceptible to corrosion than field welds. See Tr. at 432-34.

In sum, CP&L and the staff again have the better of the argument. Those with expertise in the fields of corrosion, welding, and ASME Code requirements attest on behalf of these two parties that the procedures that were used to

substitute for construction records and examination during lay-up are adequate to assure a level of safety as required by the regulations. See Tr. at 404-05. Moreover, even BCOC's witness Mr. Lochbaum, when asked what he would require in the Alternative Plan to satisfy his concerns replied, "[a] complete visual inspection of the interior piping surfaces, all of the welds of the embedded portions, and some evaluation, analysis or inspection of the exterior piping surfaces." CP&L Summary, exh. 10, at 218-19 (Lochbaum Deposition). The record established that is just what has been done to document the Alternative Plan's compliance with section 50.55a.

We find, therefore, that the Alternative Plan is adequate to satisfy the applicable requirements of the regulations including those of 10 C.F.R. § 50.55a(a)(3), and 10 C.F.R. Part 50, App. B. Further, in accordance with 10 C.F.R. § 2.1115(a), we find relative to this portion of contention TC-3 that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based on the record before us, dispose of this portion of the contention as being resolved in favor of CP&L.

4. Consequences of Piping or Weld Failure

DISCUSSION: CP&L Summary at 104; Staff Summary at 66-69; Tr. at 375-81, 411-14, 431.

a. Parties' Positions. In its written summary, BCOC did not address the question of the safety implications of piping or weld leakage. Nor did BCOC's technical witness, Mr. Lochbaum, postulate any complete scenario that would lead to loss of cooling, damage to safety equipment, or releases to the environment during his October 1999 deposition or otherwise. Indeed, when questioned about the possible consequences of leakage, Mr. Lochbaum could not point to any precise scenario in which leakage could be large enough to interfere seriously with system function or release contaminants to the environment. At oral argument, however, BCOC briefly addressed the matter, arguing that tritium leakage has occurred from spent fuel pools at other facilities and that all equipment should conform to quality requirements.

CP&L asserts that since the piping is embedded in reinforced concrete, there is no way for a leak to result in loss of water that even approaches the normal evaporation rate from the pool, that there is an entirely redundant run of piping to carry water in the event of a broken pipe, and that there is no pathway to the environment. When, at oral argument, the Board pursued the question of possible leakage

into sensitive equipment, CP&L explained there was no equipment that pool water could leak into that would compromise the safety of the plant. Further, during oral argument CP&L showed diagrams of the fuel pool building that indicated that leakage would not have any path to the environment, but would be captured by floor drains and diverted to the plant's waste processing system. And under Board questioning concerning a historical incident in which pool water contaminated the environment by leakage, CP&L explained how the instant circumstances were substantially different in matters involving pool and building design from those mentioned by the Board.

For its part, the staff offered the affidavit of NRC reactor systems engineer Christopher Gratton addressing the question of whether the failure of the welds or piping could result in a hazard affecting public health and safety. The staff argues that such a result is unlikely and concludes whether or not leakage is able to flow out of the pool's concrete structure, a break in the embedded piping or welds whose leakage is within the coolant systems makeup capacity would have a minimal effect on the operation of the system, the coolant inventory, or the safety of the stored fuel. See Staff Summary at 67. Moreover, according to the staff, even if substantial leakage were to occur, the position of the pools' piping penetrations is such that only forced

cooling would be lost, the pool level would remain well above the stored fuel, and the rate of boil-off would be well within the capacity of available coolant makeup systems. The staff thus concludes that the stored fuel would remain covered and cooled with only a minimal impact on safety.

b. Board Ruling. In theory, the leakage from a spent fuel pool could be so severe that the cooling system would become inoperable, either from low water level or ruptured pipes; the leakage could result in the release of pool water (presumably contaminated at least with tritium) to the environment; or the leakage could penetrate safety-related equipment and cause it to malfunction. Based on the record now before us, however, it is clear that the result of any weld or piping failure at Harris could have only a limited number of effects on the integrity of the plant and the health and safety of the public.

The Board has already found that the CP&L Alternative Plan offers quality assurance and safety equivalent to the requirements of the regulations. And for its part, BCOC has offered no reason to suggest that a leak from the welds or piping at issue would in any way parallel the SFP leakage situations it relied upon at the January 21, 2000 oral argument. Indeed, upon Board inquiry regarding one of the pools mentioned by BCOC, CP&L described in some detail the

reasons why that leakage situation differed from circumstances at the Harris plant.

To be sure, BCOC accuses CP&L and staff of ignoring the health significance of continuous small leaks in nuclear power plant piping. Yet, from the record before us, we have no reason to believe that small amounts of leakage, such as those which could occur from pinholes or hairline cracks in pipes embedded in concrete, would lead to any hazard to the plant or the public.

Consequently, in accordance with 10 C.F.R. § 2.1115(a), we find relative to this portion of contention TC-3 that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based on the record before us, dispose of this portion of the contention as being resolved in favor of CP&L.

5. Need for a Construction Permit

DISCUSSION: BCOC TC-3 Summary at 16; Tr. at 200-01, 327-32, 348-53, 391-93, 417-18.

a. Parties' Positions. Although BCOC first raised this issue of whether a construction permit is needed to prepare and activate the spent fuel pool C and D systems in its written statement, it denies the question is a "new contention," asserting it was clearly embodied in contention TC-3 as admitted. Tr. at 327. According to BCOC, the need

for a construction permit is connected to its assertion that the applicant had not complied with 10 C.F.R. Part 50, App. B.

CP&L, however, claims that this issue is a new contention that has not been shown to meet the late-filing standards of 10 C.F.R. § 2.714(a)(1). CP&L also argues that it is not seeking either a construction permit or conversion of such a permit into an operating license, but rather a change in its operating license pursuant to 10 C.F.R. §§ 50.59, 50.90. Further, to CP&L's knowledge, no construction permit has been required for any of the large post-Three Mile Island accident changes or, indeed, for replacement of steam generators or power upgrades, and that there has never been a construction permit required for a change in an operating license applying to a commercial operating plant. In this regard, CP&L relies upon 10 C.F.R. § 50.92(a) that states "[i]f the application involves the material alteration of a licensed facility, a construction permit will be issued before the issuance of the amendment to the license."

CP&L further argues that this "material alteration" test has been interpreted as a change in the type of major components at an existing facility, a change that would introduce significant new issues relating to the function and nature of the facility and to the public health and

safety. CP&L cites as precedent a Director's Decision, Virginia Electric and Power Co. (Surry Power Station, Units 1 and 2), DD-79-19, 10 NRC 625, 654-61 (1979), in which the Director of Nuclear Reactor Regulation found that the replacement of reactor steam generator internals did not rise to the significance of a "material alteration" to the plant. CP&L, in reply to a Board question, went so far as to say that even if the additional spent fuel pools had to be constructed "from scratch," that would not constitute a material alteration under the regulations. See Tr. at 351-52.

The staff also regards the question of the requirement for a construction permit as embodying a new contention and as a matter that did not come out in discovery. The staff agreed with CP&L that the amendment at issue does not represent a material alteration of the facility, noting that the staff's review of the case law generally is in accord with CP&L's. Although the staff equivocated somewhat on whether building new pools would require a construction permit, it agreed that steam generator replacement or the construction of new buildings do not require a construction permit, but rather could be accomplished by an amendment under 10 C.F.R. § 50.59.

b. Board Ruling. BCOC's claim that a construction permit is required for the CP&L request was not a part of

the admitted contention. As such, it can only be admitted if it fulfills the section 2.714(a) late-filing standards, which BCOC has made no effort to address. This precludes further consideration of the issue. See Boston Edison Co. (Pilgrim Nuclear Power Station), ALAB-816, 22 NRC 461, 465-68 (1985). Even if this claim had been within the scope of contention TC-3, however, under the circumstances here, we are skeptical that the amendment before us is a "material alteration" in the sense intended by the regulations so as to require a construction permit.

Once again, pursuant to 10 C.F.R. § 2.1115(b), we find relative to this portion of contention TC-3 that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based on the record before us, dispose of this portion of the contention as being resolved in favor of CP&L.

III. CONCLUSION

With respect to contention TC-2, Inadequate Criticality Prevention, the Board concludes that (1) applicant CP&L's request to utilize credit for burnup and enrichment as criticality control measures is consistent with the requirements of 10 C.F.R. Part 50, App. A, GDC 62; and (2) the use of credit for burnup and enrichment does not violate

the double contingency principle of draft Regulatory Guide 1.13. In connection with contention TC-3, Inadequate Quality Assurance, we conclude relative to the embedded welds and piping at issue, the CP&L Alternative Plan is sufficient under 10 C.F.R. § 50.55a(a)(3) and 10 C.F.R. Part 50, App. B, to provide an acceptable level of quality and safety. Further, as to both contentions, based on the record before us, pursuant to 10 C.F.R. § 2.1115(a), the Board further concluded that there is no genuine and substantial dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing and, based on the record before us, we dispose of those contentions as resolved in favor of CP&L.[14]

For the foregoing reasons, it is this fifth day of May 2000, ORDERED, that with respect to BCOC contentions TC-2, Inadequate Criticality Control, and TC-3, Inadequate Quality Assurance, in accordance with 10 C.F.R. § 2.1115(a), the Board concludes (1) there is no genuine and substantial

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[14] Although this ruling completes action regarding all the technical contentions before us relative to the December 1998 CP&L amendment request, because the admissibility of four BCOC late-filed environmental contentions is yet to be resolved, this proceeding is not subject to dismissal in accordance with 10 C.F.R. § 2.1115(a)(2).

dispute of fact or law that can only be resolved with sufficient accuracy by the introduction of evidence in an evidentiary hearing; and (2) contentions TC-2 and TC-3 are disposed of as being resolved in favor of CP&L.

THE ATOMIC SAFETY
AND LICENSING BOARD[15]

G. Paul Bollwerk, III
ADMINISTRATIVE JUDGE

Frederick J. Shon
ADMINISTRATIVE JUDGE

Peter S. Lam
ADMINISTRATIVE JUDGE

Rockville, Maryland

May 5, 2000

[15] Copies of this memorandum and order were sent this date by Internet e-mail transmission to counsel for (1) applicant CP&L; (2) intervenor BCOC; and (3) the staff.

NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB MEMORANDUM AND ORDER (RULING ON DESIGNATION OF ISSUES FOR AN EVIDENTIARY HEARING (LBP-00-12) have been served upon the following persons by U.S. mail, first class, or through NRC internal distribution.

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Docket No. 50-400-LA
LB MEMORANDUM AND ORDER
(RULING ON DESIGNATION OF
ISSUES FOR AN EVIDENTIARY
HEARING (LBP-00-12)

Adria T. Byrdsong
Office of the Secretary of the Commission

Dated at Rockville, Maryland,
this 5th day of May 2000