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

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

DETAILED SUMMARY OF FACTS, DATA AND ARGUMENTS AND SWORN SUBMISSION ON WHICH ORANGE COUNTY INTENDS TO RELY AT ORAL ARGUMENT TO DEMONSTRATE THE EXISTENCE OF A GENUINE AND SUBSTANTIAL DISPUTE OF FACT WITH THE LICENSEE REGARDING THE PROPOSED EXPANSION OF SPENT FUEL STORAGE CAPACITY AT THE HARRIS NUCLEAR POWER PLANT

WITH RESPECT TO QUALITY ASSURANCE ISSUES (CONTENTION TC-3)

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January 4, 2000

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WITH RESPECT TO QUALITY ASSURANCE ISSUES

I. INTRODUCTION

Pursuant to 10 C.F.R. § 2.113, Orange County hereby submits a detailed written summary and sworn submission (hereinafter "Summary") of all the facts, data, and arguments which are known to the County and on which the County proposes to rely at the January 21, 2000, oral argument. This Summary presents Orange County's legal and factual grounds for asserting that Carolina Power & Light's ("CP&L's") application to amend its Operating License by expanding the capacity of spent fuel pool storage pools at the Harris nuclear power plant fails to satisfy the NRC's quality assurance standards in

Appendix B to 10 C.F.R. Part 50 and and fails to provide adequate protection of public health and safety to members of the public living in the vicinity of the Harris plant.[1]

As required by 10 C.F.R. § 2.111(b), the factual assertions in this Summary are submitted under the sworn declaration of David Lochbaum, the County's expert witness on quality assurance issues. A further declaration of Mr. Lochbuam's qualifications and experience and a description of his work on this Summary is attached as Exhibit 1.

As detailed below, this Summary demonstrates that as a matter of law, CP&L's License Amendment Application must be rejected because CP&L cannot demonstrate that the cooling system for pools C and D has been constructed and maintained in conformance with a valid construction permit, nor can it demonstrate that the cooling system for pools C and D complies with the quality assurance requirements of Appendix B. If the Board does not find that the issue can be disposed of clearly as a matter of law, the County submits that it has submitted substantial evidence that there is a genuine and substantial factual dispute between CP&L and the County regarding whether CP&L satisfies the NRC's quality assurance requirements for the issuance of an operating license amendment.

II. STATEMENT OF THE CASE

This case raises the question of whether CP&L is entitled to an operating license amendment that would allow it to complete construction on and put into service a partially-built safety-related spent fuel cooling system that was abandoned over 15 years ago. CP&L allowed its construction permit for this system to lapse in 1983, dropped its Quality Assurance program for the system, and made no effort to maintain the already-

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1 *See* Letter from James Scarola, CP&L, to NRC, re: Shearon Harris Nuclear Power Plant, Docket No. 50-400/License No. NPF-63, Request for License Amendment, Spent

constructed portion of the system in compliance with the storage and maintenance requirements of Appendix B to 10 C.F.R. Part 50.

NRC regulations for the review of operating license amendment applications require the agency to be guided by considerations which govern the issuance of initial licenses to the extent applicable and appropriate. 10 C.F.R. § 50.92(a). Here, it is appropriate and applicable to inquire whether CP&L meets the standard for converting a construction permit to an operating license, as provided by 10 C.F.R. §§ 50.56 and 50.57. Because it has allowed its construction permit and associated quality assurance program to lapse for the already-constructed portion of the pools C and D cooling system, and because it not completed the rest of the system in compliance with any valid construction permit, CP&L cannot demonstrate that it satisfies these standards. Therefore, its operating license amendment application must be rejected as a matter of law.

Moreover, even assuming for purposes of argument that CP&L could somehow qualify for an operating license amendment under these circumstances, it has failed to demonstrate that the inaccessible embedded portion of the piping that has already been constructed for pools C and D is in a condition that is acceptable for the licensing of safety-related coolant piping in a nuclear power plant. Corrosion and degradation of piping at nuclear power plants are recognized by the NRC as a threat to safety systems that must be addressed by proper maintenance and monitoring of those systems. The piping for spent fuel pools C and D has sat idle and unattended, in flooded or partially flooded conditions, for over fifteen years, with possible exposure to bacterial contamination. During that time, no attempt has been made to ensure its integrity or to monitor the conditions to which it was subjected.

Fuel Storage (December 23, 1998), (hereinafter "License Amendment Application).

CP&L claims that as a result of a video camera inspection and limited water testing, it has demonstrated that the embedded piping and welds are free from any significant corrosion or degradation. A number of significant questions have not been resolved by CP&L, however. CP&L's recent water chemistry and bacteria tests provide only a current "snap shot" of the conditions in the piping, and it remains undetermined whether they were exposed to bacterial contamination over the past 15 years. Moreover, the video camera inspection covered only 15 embedded welds. Despite its claims to the contrary, the evidence shows that CP&L did not examine the piping itself. Nor did CP&L examine the unknown number of shop welds that are also included in the embedded piping. Finally, the video tapes did reveal signs of corrosion and degradation, which were not adequately investigated or resolved by CP&L. Thus, the condition of the piping and welds in the embedded portion of the cooling system for pools C and D remains unknown to a significant degree. Under these circumstances, CP&L cannot vouch for their compliance with the quality assurance requirements of Appendix B, or for their reliability as safety systems.

III. FACTUAL AND PROCEDURAL BACKGROUND

A. Construction and Operation of Harris Nuclear Power Plant

In 1978, CP&L obtained a construction permit to build a four-unit nuclear power plant in Wake and Chatham Counties, North Carolina. The design of the "Shearon Harris" nuclear plant included four spent fuel storage pools, to serve all four units.

Like all other construction permittees, CP&L had a construction quality assurance ("QA") program, which was reflected in its QA Manual. In the Construction QA Manual, CP&L mades it clear that the purpose of the construction QA program was to

ensure the institution of "quality measures" that will ensure safety throughout the life of the plant, including operation:

> It is the policy of the Carolina Power & Light Company to engineer, construct, and operate nuclear power plants without jeopardy to public health and safety. Measures shall be set forth and documented for quality assurance which encompass those responsibilities within CP&L and those responsibilities delegated to companies supporting the engineering, construction and start-up of nuclear power plant projects. These documented measures comprise the CP&L ASME Quality Assurance Manual and shall be strictly adhered to. *This Manual provides quality measures for assuring nuclear safety for long-term power production; engineering design requirements and objectives are achieved in construction of new facilities; and plant functional capability is maintained in operating plants. These measures assure compliance with the quality requirements of ASME Boiler and Pressure Vessel Code, Section III, division 1, Nuclear Power Plant Components and applicable Federal State and local regulations and codes.*[2]

In other words, the commitments made by CP&L to construct and maintain the Harris plant in conformance with NRC safety regulations were intended to be continuous and carry over into the operating license term, in order to ensure safe operation throughout the life of the plant.

CP&L built only Unit 1, and cancelled the other three reactors. Units 3 and 4 were cancelled in 1981, and Harris Unit 2 was cancelled in 1983. Although CP&L had completed construction of pools C and D in the early 1980's, it discontinued construction of the spent fuel cooling and cleaning systems for those pools in 1983, when Unit 2 was cancelled. At that point, CP&L allowed its construction permit to lapse for the cooling

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2 Construction QA Manual Policy Statement. (emphasis added). The Policy Statement appears in the front of ASME Quality Assurance Manual for the Construction of the Shearon Harris Nuclear Power Plant , Rev. 4 (approved 3/21/85). An incomplete copy of the construction QA Manual (containing odd pages only) was submitted by CP&L as Enclosure 5 to an April 30, 1999, letter from Donna B. Alexander, CP&L, to U.S. NRC. The April 30, 1999, letter is attached as Exhibit 2. Relevant pages of the Construction QA Manual are attached as Exhibit 2b.

and cleaning system for pools C and D, and discontinued any attempts to maintain a QA program for the portion of the system.

When CP&L obtained its operating license in 1987, the license covered only the use of pools A and B for fuel storage.

B. P&L License Amendment Application

By letter of December 23, 1998, CP&L submitted to the NRC Staff an application to amend its operating license for the Harris Nuclear plant. The License Amendment Application sought permission to put pools C and D into service, for the purpose of storing additional spent fuel from Harris and CP&L's other nuclear reactors, Brunswick and Robinson. The requested license amendment would allow CP&L to store up to 927 PWR and 2763 BWR assemblies in pools C, and 1,025 PWR assemblies in pool D.

Due to the previous abandonment of the cooling and cleaning system for pools C and D, the proposed activation of the pools raised several quality assurance issues. First, CP&L must complete construction of the cooling and cleanup system for these pools and install tie-ins to the existing Harris Unit 1 component cooling water system to provide heat removal capabilities.[3] Second, CP&L had discarded or lost weld certification documents for approximately 40 of the nearly 200 large bore welds in the system.[4] Finally, CP&L had failed to maintain its quality assurance program for the piping and welds that had been installed for the pools C and D cooling system, and therefore it had no way of demonstrating that the piping had been maintained and protected from deterioration during the 15 years that it had sat idle.

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3 License Amendment Application, Enclosure 1 at 4.
4 License Amendment Application, Enclosure 8 at 3.

To address the quality assurance issues raised by its License Amendment Application, CP&L included Enclosure 8, entitled "10CFR50.55a Alternative Plan." The plan was "intended to provide the basis for construction requirements for the completion of this portion of the Harris Plant and to justify the acceptability of previously constructed equipment in light of missing documentation."[5] The Alternative Plan included a discussion of a new quality assurance program for completion of the portions of the cooling and cleaning system that have yet to be built.[6] The Plan also described a plan for reconstructing, to the extent possible, the lost records. In addition, for 15 embedded field welds, the plan included a proposal to inspect approximately a third of the welds with a remote video camera.[7] The Alternative Plan contained no mention, however, of how CP&L intended to demonstrate that the quality of the embedded piping and welds had not deteriorated unacceptably over the past 15 years during which it had been left idle, without any maintenance or monitoring of its condition. Nor is the issue addressed elsewhere in the License Amendment Application.

Following the submission of the License Amendment Application, the NRC Staff issued several Requests for Additional Information regarding the quality assurance issues raised by the application, to which CP&L responded.[8] In response to these requests,

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5 License Amendment Application, Enclosure 8 at 1.
6 License Amendment Application, Enclosure 8 at 11.
7 License Amendment Application, Enclosure 8 at 7.
8 *See* letter from Donna B. Alexander, NRC, to U.S. NRC (April 30, 1999) (Exhibit 2) and Enclosure 1 (Exhibit 2a) (hereinafter "April 30, 1999 RAI Response'); letter from Donna B. Alexander, CP&L, to U.S. NRC (October 29, 1999) (Exhibit 3) and Enclosure 1 (Exhibit 3a) (hereinafter "October 29, 1999 RAI Response"). Although there is no accompanying cover letter to indicate transmittal, it is Orange County's understanding that in December of 1999, CP&L also submitted additional material to the NRC Staff, consisting of Engineering Services Report ("ESR") No. 98-00266 entitled "Evaluate Unit 2 & 3 Cooling Embedded Piping (approved December 21, 1999), with three attachments: (1) a set of "Remote Visual Examination Data Sheets" recorded during the video camera

CP&L submitted additional information, including the results of a single set of water chemistry and bacteria tests taken in the embedded piping, the results of a video camera inspection of the 15 fields welds located in the embedded piping, and evaluations by CP&L and an outside consultant of the results of the video inspections and water tests.

C. Orange County's Intervention in License Amendment Proceeding

On January 7, 1999, the NRC published a notice of opportunity for a hearing on the proposed license amendment, at 64 Fed. Reg. 2,237. Orange County filed a timely hearing request and intervention petition on February 12, 1999. On April 5, 1999, Orange County submitted contentions challenging the adequacy of the License Amendment Application.

In LBP-99-25, Memorandum and Order (Ruling on Standing and Contentions), the Licensing Board ruled that Orange County had standing, and admitted two of the County's contentions. 50 NRC 25 (1999). As admitted by the Licensing Board, Contention TC-3 (Inadequate Quality Assurance) reads as follows:

> CONTENTION: 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).

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inspection, (2) Report No. SIR-99-127 by Structural Integrity Associates, Inc., entitled "Evaluation of Embedded Welds in Spent Fuel Piping at Harris Nuclear Plant," Revision No. 2 (December 1999); and (3) Technical Report 99-179 by CP&L's Material Services Section, Metallurgy Services, re: Harris Nuclear Plant – Bacterial Detection in a Deposit Sample and Chemical Analysis of Reddish-Brown Material from the C&D Spent Fuel Pool Cooling Lines (approved December 16, 1999). The ESR and its attachments were provided to Orange County under cover of a December 23, 1999, letter from John H. O'Neill to Diane Curran. These materials are attached as Exhibit 4.

> 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.

50 NRC at 36.

As required by 10 C.F.R. § 2.1111, the Board offered the parties an opportunity to invoke the hybrid hearing process outlined in Subpart K. This process establishes a 90-day discovery period, followed by the filing of a detailed written summary of all facts, data and arguments that each party intends to rely on to support the existence of a genuine and substantial dispute of fact regarding any admitted contentions. Following this filing, an oral argument is held. CP&L invoked the hybrid hearing process, and therefore this Summary is being filed herewith.

ARGUMENT

IV. LEGAL STANDARDS

A. The Licensing Board Must Assign the Burden of Proof to the Applicant In Determining Whether There Is a Genuine and Substantial Dispute of Fact on Any Material Issue.

The NRC's regulations governing the hybrid hearing procedures for expansion of spent fuel pool storage capacity are found in Subpart K of 10 C.F.R. Part 2. Where one of the parties has elected an oral argument under 10 C.F.R. § 2.1109, the parties are

required to present, in written summaries and oral argument, all of the facts, data and arguments which are known to the parties and on which they intend to rely.

Pursuant to 10 C.F.R. § 2.1115(a), the Licensing Board must evaluate the oral argument and the written facts and data submitted by the parties in order to:

> (1) Designate any disputed issues of fact, together with any remaining issues of law, for resolution in an adjudicatory hearing; and
>
> (2) Dispose of any issues of law or fact not designated for resolution in an adjudicatory hearing.

The regulations also state that no issue of law or fact shall be designated for resolution in an adjudicatory hearing unless the presiding officer determines that:

> (1) There is "a genuine and substantial dispute of fact which can only be resolved with sufficient accuracy by the introduction of evidence in an adjudicatory hearing; and
>
> (2) The decision of the Commission is likely to depend in whole or in part on the resolution of that dispute.

10 C.F.R. § 2.1115(b)(1) and (2).

In considering whether this standard is met, it is necessary that the Licensing Board place the burden of proof on CP&L as the applicant for and proponent of the proposed license amendment, as required by 10 C.F.R. § 2.732. Although Orange County is unaware of any NRC cases explaining the manner in which the burden of proof is to be placed on the applicant, some guidance may be taken from the Commission's precedents regarding the allocation of the burden of proof in a summary disposition proceeding. The NRC's Subpart K regulations differ from the summary disposition regulations in that they call for a determination of whether there is a material factual dispute that warrants adjudication, while the summary disposition standard requires the movant to demonstrate that there is no material dispute to be litigated. *Compare* 10

C.F.R. § 2.1115(b) with § 2.749. Nevertheless, the "movant" for a summary disposition ruling can be compared to the "movant" for an operating license amendment under Subpart K.

In a summary disposition proceeding, the burden of proof is on the movant, and "the evidence submitted must be construed in favor of the party in opposition thereto, who receives the benefit of any favorable inferences that can be drawn."[9] Furthermore, if there is any possibility that a litigable issue of fact exists or any doubt as to whether the parties should be permitted or required to proceed further, the motion must be denied.[10]

Accordingly, in order to ensure that the burden of proof remains with the Applicant and is not shifted improperly to the County in this proceeding, the Board should construe all of the evidence in favor of the County, and give the County the benefit of any favorable inference that can be drawn from the evidence. If there is any doubt as to whether a factual or legal issue can be resolved based on the written evidence or oral argument, the Board should proceed to an adjudicatory hearing.

B. The NRC's Review of CP&L's License Amendment Application Must Be Governed By Applicable and Appropriate Considerations, Including Whether the Applicant Complies With the Quality Assurance Requirements of 10 C.F.R. Part 50, Appendix B.

The Commission's regulations governing the consideration of license amendment applications instruct that:

In determining whether an amendment to a license or construction permit will be

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[9] *Sequoyah Fuels Corp. and General Atomics Corp.* (Gore, Oklahoma Site Decontamination and Decommissioning Funding), LBP-94-17, 39 NRC 359, 361, *aff'd* 40 NRC 55, CLI-94-11 (1994); *Advanced Medical Systems, Inc.* (One Factory Row, Geneva, Ohio 44041), CLI-93-22, 38 NRC 98, 102 (1993).

[10] *General Electric Co.* (GE Morris Operation Spent Fuel Storage Facility), LBP-82-14, 15 NRC 530, 532 (1982).

> issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses or construction permits to the extent applicable and appropriate. If 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.

10 C.F.R. § 50.92(a). Thus, pursuant to 10 C.F.R. § 50.92(a), review of CP&L's license amendment application must be guided by "applicable" and "appropriate" considerations that would have governed the initial issuance of an operating license. If the application involves a "material alteration" to the Harris plant, then CP&L must seek an amendment of its construction permit.

The question of what constitute "applicable and appropriate" considerations may be answered by examining the nature of the activity for which CP&L seeks authorization. CP&L seeks permission to operate a portion of the Harris nuclear power plant that was partially built many years ago, but for which CP&L never sought an operating license: the spent fuel pool cooling system for pools C and D. Under the circumstances, "applicable" and "appropriate" considerations include the same considerations that would have applied had CP&L included pools C and D in its original operating license application, *i.e.*, whether the requirements for "converting" the construction permit to an operating license had been met. These requirements are found in 10 C.F.R. §§ 50.56 and 50.57. Section 50.56 entitled "Conversion of construction permit to license; or amendment of license," provides that:

> Upon completion of the construction or alteration of a facility, in compliance with the terms and conditions of the construction permit and subject to any necessary testing of the facility for health or safety purposes, the Commission will, in the absence of good cause shown to the contrary issue a license of the class for which the construction permit was issued or an appropriate amendment of the license, as the case may be.

Section 50.57(a)(1) further provides that:

> (a) Pursuant to § 50.56, an operating license may be issued by the Commission, up to the full term authorized by § 50.51, upon finding that:
>
> > (1) Construction of the facility has been substantially completed, in conformity with the construction permit and the application as amended, the provisions of the Act, and the rules and regulations of the Commission.

The "rules and regulations" for which compliance must be demonstrated include the NRC's QA criteria for construction and operation of nuclear power plants, which are found in Appendix B to 10 C.F.R. Part 50, including Criterion XIII (Handling, Storage, and Shipping) and Criterion XVI (Corrective Actions). As set forth in the Introduction to Appendix B, every applicant for a construction permit is required to "include in its preliminary safety analysis report a description of the quality assurance program to be applied to the design, fabrication, construction, and testing of the structures, systems, and components of the facility." Every applicant for an operating license "is required to include, in its final safety analysis report, information pertaining to the managerial and administrative controls to be used to assure safe operation." Appendix B also sets forth quality assurance requirements "for the design, construction, and operation of . . . structures, systems, and components" that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. These requirements apply to:

> all activities affecting the safety-related functions of those structures, systems, and components; these activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying.

Id., Introduction to Appendix B. In other words, the quality assurance requirements to which a construction permit applicant commits before construction begins follow a

nuclear power plant's safety equipment continuously, throughout construction and into its operating life. Pursuant to 10 C.F.R. §§ 50.56 and 50.57, an operating license may only be issued if it can be found that the operating license applicant has complied with its QA program throughout construction and any period following construction, and that it will continue to comply with those requirements in the future.

If the terms of a construction permit have been fulfilled and its QA requirements complied with, then the issuance of an operating license constitutes merely the "conversion" of the construction permit into an operating license. If, on the other hand, there is no valid construction permit at the time of an operating license application or application for an operating license amendment, then there is nothing to be converted. If the applicant seeks to build new safety systems and/or use safety systems for which no valid construction permit existed, such a case would involve a material alteration to the facility, such that a construction permit amendment would be required before the activity can be authorized.

V. THE LICENSE AMENDMENT APPLICATION SHOULD BE DENIED BECAUSE IT FAILS TO DEMONSTRATE THAT CP&L SATISFIES THE REQUIREMENTS OF 10 C.F.R. PART 50, APPENDIX B.

As discussed in Section IV.B above, the NRC's review of this license amendment request must be governed by "the considerations which govern the issuance of initial licenses or construction permits to the extent applicable and appropriate." 10 C.F.R. § 50.92(a). This is a case in which the applicant seeks to complete and use a partially built safety system that was never included in the original operating license for the Harris plant. Under the circumstances, the applicable and appropriate inquiry is whether the system meets the standard for conversion of the construction permit to an operating

license, as required by 10 C.F.R. §§ 50.56 and 50.57. Had CP&L sought to include the C and D spent fuel cooling system in its original operating license, it would have been required to demonstrate that the construction of the system was completed in accordance with NRC regulations and CP&L's construction permit. Now, 15 years later, CP&L seeks to expand the scope of its operating license to include pools C and D. It is applicable and appropriate that CP&L stands in the same position where it would have stood 16 years ago: it must demonstrate that it is appropriate to convert the construction permit to an operating license for this system.

By its own admission, however, CP&L has no valid construction permit that can be converted to an operating license for pools C and D. CP&L is unable to make the showing required by 10 C.F.R. §§ 50.56 and 50.57 in two significant respects. First, CP&L has not completed construction of a significant portion of the spent fuel cooling and cleaning system for pools C and D. There is no basis for finding, under 10 C.F.R. § 50.56 or § 50.57, that construction has been completed in conformance with the construction permit, because (a) there is no valid construction permit in existence for finishing this construction, and (b) construction has not been completed.

Second, for the related portion of the C and D cooling system that has already been built, CP&L has no basis for seeking to convert the construction permit to an operating license, because CP&L allowed the construction permit to lapse when it abandoned Unit 2 in 1983. The commitments made in the construction permit – *i.e.,* to ensure the quality of safety-related equipment and materials throughout construction and operation – have been abandoned. By the same token, any effort to comply with the requirements of Appendix B has been abandoned.

A. CP&L Has Failed to Demonstrate that the Cooling System for Pools C and D Has Been Built In Conformance With A Valid Construction Permit.

CP&L acknowledges in its operating license application that it has not completed construction of the cooling system for pools C and D.[11] CP&L also acknowledges that the original construction program "no longer exists and it is not possible to complete construction of the 'C' and 'D' FPCCS as a continuance of this program."[12] In the License Amendment Application, CP&L seeks approval of an alternative QA program for construction of the unfinished portion of the cooling system.

This portion of CP&L's license amendment application is not capable of satisfying 10 C.F.F. § 50.56 or 50.57, because the construction of the cooling system has not been completed. CP&L does not even have an approved construction permit against which the system could be completed. Thus, there is no basis for finding that construction has been completed in conformance with the construction permit and the regulations. CP&L may not be granted an operating license amendment unless and until (a) the terms of a new or amended construction permit are approved, and (b) the construction is completed in conformance with the construction permit and the regulations.

B. CP&L Has Failed to Demonstrate Compliance with Criterion XIII (Handling, Storage and Shipping).

With respect to the already-built portion of the cooling system for Pools C and D, CP&L must demonstrate that it complies with Criterion XIII, which requires that:

> Measures 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. When necessary for

11 License Amendment Application, Enclosure 8 at 11.
12 *Id.*

> particular products, special protective environments, such as inert gas atmosphere, specific moisture content levels and temperature levels shall be specified and provided.

The preservation of material and equipment to prevent damage or deterioration is known as "lay-up." Putting material and equipment in proper lay-up generally involves making sure equipment is clean before going into storage, and ensuring that once it is in storage it is not subject to damage from environmental conditions, such as moisture-caused corrosion. Monitoring or periodic inspection of equipment in order to verify that it has not been damaged or degraded is often required.

The maintenance of unused piping equipment in a safe lay-up condition is not a mere formality, but a significant safety issue. When piping and equipment remain unused for long periods, they can suffer degradation which impairs their ability to perform their function, with potential adverse effects on safety. The potential fouling and/or degradation of piping in nuclear power plant cooling systems has been the subject of several NRC notices to licensees, alerting them to "problems which can occur if equipment is improperly stored or laid up during construction or extended plant outages." *See* Information Notice No. 85-56, "Inadequate Environmental Control for Components and Systems in Extended Storage or Layup" (July 15, 1985).[13] *See also* Information Notice No. 85-30, "Microbiologically Induced Corrosion of Containment Service Water System" (April 19, 1985)[14]; NRC Information Notice No. 94-38, "Results of a Special NRC Inspection at Dresden Nuclear Power Station Unit 1 Following a Rupture of Service

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13 A copy of this Information Notice is attached as Exhibit 5.
14 A copy of this Information Notice is attached as Exhibit 6.

Water Inside Containment" (May 27, 1994)[15]; NRC Inspection Procedure 92050, "Review of Quality Assurance for Extended Construction Delay."

As discussed in Section IV.B. above, CP&L is required to do more than demonstrate *prospective* compliance with GDC XIII. It must also demonstrate that it has maintained the cooling system for pools C and D throughout the time of construction and up until the time of licensing, such that the construction permit may be converted into an operating license for this system. By its own admission, CP&L cannot make this demonstration.

CP&L's QA manual for operation addresses material storage as follows:

> 5.5.1: Items shall be stored in designated storage areas. Identification tags or marks and the inspection status shall be retained on items or on records which are traceable to the items. *Release of accepted items shall be controlled to prevent damage, deterioration, or unauthorized storage and release.*[16]

(emphasis added) CP&L's QA Manual also requires periodic inspection of stored equipment:

> 5.6.1. Inspection shall be maintained over items in storage areas. This program shall include:
>
> > 5.6.1.1 Periodic inspections to assure that items are properly controlled, maintained, and protected. Inspections shall be documented.
> > 5.6.1.2 The identification and control of nonconforming items until proper disposition is made.

For the already-built portion of the cooling system for pools C and D, however, CP&L has not implemented these aspects of its QA program.

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15 A copy of this Information Notice is attached as Exhibit 7.

16 CP&L Corporate (Appendix B) Quality Assurance Manual , NGGM-PM-0007, Rev. 1 (Effective Date: July 10, 1998) ("QA Manual"). A copy of the Corporate QA Manual was attached as Enclosure 14 to CP&L's April 30, 1999, RAI Response. Relevant excerpts are attached as Exhibit 2b.

When CP&L decided not to pursue an operating license for Unit 2, it put only some of the Pools C and D cooling system equipment into lay-up, namely the heat exchangers. The lay-up measures described by CP&L were as follows:

> The spent fuel pool heat exchangers were capped to preclude introduction of foreign material, and provided with a nitrogen blanket on the shell (CCW) side to prevent moisture and other contaminants from inducing corrosion.[17]

Thus, CP&L conceded by these actions that moisture (i.e., humidity) and contaminants represented a corrosion threat to the unused Unit 2 spent fuel pool cooling system equipment.

Nevertheless, CP&L instituted no lay-up measures for the Unit 2 spent fuel cooling system piping that had been installed. At the point when CP&L decided not to pursue an operating license for Unit 2, the piping and associated welds that had been installed were "spared in place."[18] Once Unit 2 was cancelled, CP&L made no effort to comply with the requirements of Appendix B, Criterion XIII, with respect to piping and associated welds for the Unit 2 spent fuel pool cooling system. Instead, CP&L simply considered that it had abandoned the equipment.

Nor has CP&L attempted to demonstrate compliance with Appendix B's requirements for storage in its license amendment application of December 23, 1998. CP&L's license amendment application makes no reference whatsoever to the Appendix B compliance problem created by the abandonment of the piping and welds for pools C and D. The only section of the license amendment application which addresses QA

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17 CP&L October 29, 1999, RAI Response, Enclosure 1 at 15. Enclosure 1 is attached as Exhibit 3a.

18 CP&L April 30, 1999 RAI Response, Enclosure 16 at 8. Enclosure 16, entitled "Supplemental Quality Assurance Requirements for the Design Change Packages Associated With Completion of the Units 2 & 3 Spent Fuel Pool Cooling System" is attached as Exhibit 2d.

issues at all -- Enclosure 8, entitled "10 CFR 50.55a Alternative Plan" – says virtually nothing about the abandoned piping and welds. Instead, it is exclusively addressed to CP&L's plans for compensating for the lack of quality assurance documentation for the welds in the system.[19] Although CP&L subsequently has submitted information purporting to demonstrate the adequate condition of the welds to perform their safety function, it has made absolutely no application for any kind of licensing action that would address or compensate for its failure to comply with Appendix B since the time that the construction permit and QA program for the pools C and D cooling system were abandoned.

Accordingly, CP&L has failed to demonstrate compliance with Criterion XIII of Appendix B for the cooling system for pools C and D, such that its construction permit could be converted to an operating license amendment. Under the circumstances, its License Amendment Application must be denied.

C. CP&L Has Failed to Comply with Criterion XVI (Corrective Action).

CP&L has also failed with Criterion XVI of Appendix B to Part 50, which requires that:

> Measures 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. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

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19 The license amendment application consists of a two-page cover letter and nine enclosures. Only Enclosure 8 addresses QA issues. The other enclosures address general background information and the basis for the changes (Enclosure 1); the basis for CP&L's determination that the proposed amendment poses no significant hazards (Enclosure 2); an environmental evaluation (Enclosure 3); page change instructions (Enclosure 4); proposed Technical Specification pages (Enclosure 5); Licensing Report for Expanding Storage Capacity in Harris Spent Fuel Pools "C" and "D", which contains "supporting technical documentation, some proprietary (Enclosure 6); a non-proprietary version of Enclosure 6 (Enclosure 7); an a thermal-hydraulic analysis of the cooling waer systems that support placing pools C and D in service (Enclosure 9).

> The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

As CP&L acknowledges, during the more than 15 years that the piping and welds for the Unit 2 spent fuel cooling system lay unused, it made no effort to correct the situation and begin to store the equipment in an appropriate condition. During that time, CP&L instituted no measures to promptly identify conditions adverse to quality in the piping that serves the Unit 2 spent fuel pool cooling system. Instead, CP&L treated the piping as if it would never be used again, *i.e.,* abandoned it.

CP&L's actions in the course of attempting to demonstrate the adequate condition of the embedded piping for pools C and D also demonstrates an *ongoing* lack of compliance with Criterion XVI. At three important junctures, CP&L has failed to demonstrate that it has a viable and effective program for implementing Criterion XVI in the present and the future.

First, despite the obvious relevance and importance to CP&L's License Amendment Application of the quality assurance questions raised by CP&L's failure to store the idle piping in compliance with GDC XIII for the past fifteen-plus years, CP&L made no attempt to address the issue in its application. As discussed above in Section V.B and note 20, CP&L's License Amendment Application completely failed to address the licensing issues raised by its non-compliance with Appendix B, or the question of whether the piping and welds serving pools C and D are in acceptable condition after having been abandoned for over 15 years. Although Enclosure 8, the "10 CFR 50.55a Alternative Plan," refers to a program of video inspection of embedded piping, this is in connection with the "Piping Pedigree Plan," *i.e.*, the alternative plan for missing

construction records.[20] The Alternative Plan does not describe what are the criteria that CP&L intends to use in inspecting the piping and welds, and the reader reasonably presumes that the criteria relate to the piping pedigree, not its condition.

Not until it responded to a March 24, 1999, Request for Additional Information ("RAI"), from the Staff did CP&L suggest that the video inspections would attempt to identify microbiologically-influenced corrosion ("MIC") or other forms of degradation, or the presence of foreign material in the pipes. In Enclosure 16 to its April 30 RAI Response, entitled "Supplemental Quality Assurance Requirements for the Design Change Packages Associated with Completion of the Units 2 & 3 Spent Fuel Cooling Systems, CP&L describes for the first time its "Equipment Commissioning Plan," *i.e.*, a program for ensuring that previously installed equipment "will meet the applicable requirements of Appendix B.[21] As discussed below, even this program was weak and limited in scope, calling for inspection of only a few of the embedded welds. CP&L did not expand the program to cover video camera inspection of all embedded welds until later, after prodding by the NRC Staff and Orange County. Moreover, as discussed below in Section E.2.c, CP&L has represented that the scope of its video inspection also included the piping, when the evidence shows that it did not.

Another example of concern is that CP&L failed to take corrective measures when it discovered defects in an embedded shop weld during the 1999 video camera inspection of 15 embedded field welds. CP&L came across the embedded shop weld inadvertently during the video camera inspection, and noted a potential lack of fusion and push-

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20 *See* Enclosure 16 to CP&L's April 30, 1999, RAI Response at 3-11 (Piping Pedigree Plan) and 7 (plan for video inspections). Exhibit 2d.

21 Enclosure 16 to CP&L's April 30, 1999, RAI Response at 8, attached as Exhibit 2d.

through.[22] The identification of this shop weld should have alerted CP&L of the necessity to locate other shop welds in the embedded piping and examine them for signs of corrosion and/or faulty welding. Instead of further investigating the condition of the shop welds, however, CP&L ignored the problem.

Similarly, as discussed below in more detail in Section E.2.e, during the video camera inspections CP&L observed foreign material covering the welds, as well as foreign debris. Rather than investigating the nature of the material to determine whether it was a product of corrosion or degradation, CP&L hydrolazed the welds and eliminated it. Although weld deposits included a "reddish-brown" deposit on one of the welds, CP&L did not attempt to analyze any samples of the deposit until after it was requested to do so by the NRC Staff.[23] Moreover, the analysis fails to determine the root cause of the deposits or the extent of damage that they caused.[24]

Accordingly, CP&L has failed to demonstrate compliance with Criterion XVI of Appendix B for the cooling system for pools C and D, either in the past or prospectively. This may be decided as a matter of law with respect to whether CP&L has complied with Criterion XVI during the period between construction and operation. With respect to prospective compliance, Orange County submits that it has raised a substantial and material issue of fact that should be heard.

C. CP&L's Operating License Amendment Application Must Be Denied As a Matter of Law.

As discussed above, it is undisputed that CP&L abandoned the cooling system for pools C and D in 1983, when it cancelled Unit 2. In the intervening 15-plus years, CP&L

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22 This issue is discussed in more detail in Section E.2.b, below.

23 *See* Letter from Kerry D. Landis, NRC, to James Scarola, CP&L, re: NRC Inspection Report No. 50-400/99-12 (December 28, 1999), attached as Exhibit 9.

concededly has made no attempt to keep up compliance with the requirements of Appendix B to Part 50 for the already-constructed portions of that system. For purposes of determining compliance with Criteria XIII and XVI of Appendix B to Part 50, the construction permit may as well never have been issued. Therefore, CP&L has no means of showing that the cooling system for pools C and D complies with Appendix B requirements, including Criterion XIII and Criterion XVI.

As a result, CP&L has no lawful basis for taking the fundamental step of converting its construction permit into an operating license. If CP&L wishes to pursue the activation of pools C and D, it must go back to "square one" and make the required demonstration that the system has been built in conformance with a valid construction permit and quality assurance program. This means that CP&L must first seek an amendment to the construction permit, demonstrating that it meets applicable standards for procurement and construction of the C and D safety systems in the first instance.

E. CP&L Has Failed to Demonstrate That the Piping and Welds for the C and D Cooling System Meet the NRC's Standards for Quality Assurance of Safety Systems.

Even if CP&L could be found to be entitled to "skip" the construction permitting phase for the pools C and D cooling system, or even if the information it has submitted could be construed somehow to address the construction permitting requirements, the License Amendment Application must be denied. The information submitted by CP&L fails to demonstrate that the piping and welds meet the NRC's quality assurance standards.

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24 *See* Section E.2.b, below.

As discussed above, CP&L describes its program for assuring the quality of the already-constructed portion of the pools C and D cooling system in an "Equipment Commissioning Plan," attached as Enclosure 16 to the April 30, 1999, RAI Response. The Equipment Commissioning Plan is described as follows:

> This section prescribes the methodology which will be followed in commissioning previously installed equipment in support of completing and activating the C & D Spent Fuel Pools. The subject equipment was installed during the original site construction effort for Unit 2 & 3 fuel storage and handling activities, and was spared in place when these units were cancelled. This equipment was never incorporated into the operating unit nor has it been formally maintained under controlled storage conditions since that time. Note that the equipment in question (including Code related equipment) was procured to applicable design and quality assurance requirements, and this plan does not take exception to any of these requirements. Rather this plan prescribes a set of criteria which will ensure that the equipment in question will meet the applicable requirements of Appendix B and is capable of performing its intended function in the completed design.[25]

Under Section 5.2.4, entitled "Development of examinations, tests and acceptance criteria," CP&L sets forth a series of activities needed to "ensure the requisite level of quality assurance in light of the lack of formal controls on storage and handling since this equipment was initially installed."[26] The activities include, *inter alia,*

- Physical inspections, testing, etc., as required to verify that lack of controlled storage conditions and regular maintenance has not caused any condition affecting quality. Commissioning criteria shall include consideration of corrosion, fouling, aging, radiation exposures, etc. For Code requirements, any degradation identified would be assessed in terms of Code requirements, with acceptability based on demonstrated compliance with those requirements.

- Physical inspections and considerations necessary to ensure that plant activities since construction have not resulted in any condition potentially adverse to quality (scavenging of parts, introduction of foreign material, damage from personnel and equipment traffic, etc). For code equipment and piping, these criteria will specifically consider code required attributes, with acceptability based on full code compliance.[27]

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25 Enclosure 16 to April 30, 1999, RAI Response at 8, Section 5.2.1.
26 *Id.* at 9, Section 5.2.4.
27 *Id.* at 9-10, Section 5.2.4.

CP&L took two principal steps to implement the Equipment Commissioning Plan. First, it conducted a test of the chemistry and bacterial activity in the piping for pools C and D in April of 1999. Second, it conducted a videotaped inspection of the field welds in the embedded piping.

The results of the bacterial test are reported in CP&L Technical Report 99-90, re: Harris Nuclear Plant – Bacteria Detection in Water from the C&D Spent Fuel Pool Cooling Lines (May 12, 1999).[28] The report was authored by Dr. Ahmad A. Moccari, a corrosion engineer employed by CP&L. The report discusses the results of bacterial testing on seven water samples, taken by CP&L from seven of the eight lines associated with embedded piping.[29] The samples were taken in the spring of 1999.[30] The purpose of the test was to determine whether sulfate-reducing bacteria were present in the lines.[31] According to the report, the results of the analysis "indicated that no nuisance bacteria capable of causing material degradation due to MIC were present in any of the seven water samples from the C&D spent fuel pool cooling lines."[32] The report also concluded that:

> The presence of microbiologically influenced corrosion (MIC) and halogen associated localized corrosion are not considered likely in the Harris Nuclear Plant C&D spent fuel pool cooling lines given that the piping is filled with demineralized water with measured very low concentrations of chloride, fluoride, and sulfate. Furthermore, since these lines have been reportedly flooded for an extended period of time, the existence of microbial activity in an aggressive form would be expected to have been evidenced by this time in the form of material

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28 A copy of the report is attached as Exhibit 9.

29 *See* CP&L October 29, 1999, RAI Response, Enclosure 1 at 11, attached as Exhibit 3a.

30 Depositon of Ahmad A. Moccari, Ph.D, Tr. at 12 (October 19, 1999). Excerpts of the transcript of Dr. Moccari's deposition transcript are attached as Exhibit 10.

31 Technical Report 99-90 at 1, Exhibit 9.

32 *Id.* at 2.

> degradation which most likely would be visible by external leakage. No such incidents have been reported by plant personnel.[33]

In support of its license amendment application, CP&L also contracted with a consulting firm, Structural Integrity Associates, Inc. ("SIA"), to evaluate the integrity of the stainless steel piping, based on existing QA records, the water quality tests, and the video camera inspection. On December 7, 1999, SIA issued a report, entitled "Evaluation of Embedded Welds in Spent Fuel Piping at the Harris Nuclear Plant" (hereinafter "SIA Report, Rev. 0"). [34] The SIA Report Rev. 0 reviewed a number of materials for the purpose of assessing "the structural integrity and suitability for service of the embedded stainless steel piping, including 15 field welds," for pools C and D.[35] The materials reviewed by SIA consist of Vendor Data Packages for nine piping segments; CP&L weld procedures, PQRs and DDRs; the videotapes of the embedded weld inspections; hydrotest records for eight piping segments; the results of the bacteria test taken in April of 1999; isometric drawings for nine piping segments; and chemistry sample data sheets from water chemistry tests taken on April 27, 1999.[36] The SIA Report Rev. 0 summarized this information, including a weld inspection that detected "reddish-brown deposits and apparent entrance holes" in one of the welds, FW-517.[37] SIA concluded that:

> A definitive determination of the root causes for these small pits would require careful microbiological and chemical sampling of the deposits and the pit interior to augment the visual examination of the as-found condition, then a similarly

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33 *Id.*. at 2.
34 Report No. SIR-99-127, Rev. 0, Evaluation of Embedded Welds in Spent Fuel Piping at Harris Nuclear Plant (December 7, 1999), attached as Exhibit 11.
35 *Id.* at 1-1.
36 *Id.* at 1-1 and Table 1-1.
37 *Id.* at 5-9.

> detailed examination of the area following removal of the deposits to better characterize the pit morphology.[38]

SIA suggested that "CP&L may choose to attempt to collect the additional information described above in order to define the root cause," but noted that:

> the location of these small indications and the material's exposure history (numerous unknowns regarding time of first wet-out and possible contamination during remote visual examination and reflooding) will make sample collection and its interpretation difficult at best. The additional sampling and visual inspection may clearly define the depth and extent of the pits (both axially or circumferentially) and provide conclusive evidence of the source of the pitting. The sampling effort may show that the present chemical and microbiological nature of the deposits is inconclusive, a possible result of the difficulties of sampling or because of the age of the pits.[39]

Nevertheless, SIA reached favorable conclusions regarding the condition of the welds and their suitability for service as part of the spent fuel cooling system for pools C and D.[40] Notably, SIA did not reach any conclusion about the suitability of the piping itself for service.

As discussed above at note 8, SIA revised its report on December 17, 1999. The report noted that CP&L had taken samples of the deposits on Weld FW-517, cleaned the weld, and further inspected it. SIA was still unable to reach a conclusion regarding the source of the pitting and deposits on the weld.[41] Nevertheless, in Section 6.3 of the revised report, SIA repeated the same favorable conclusions it had reached in Rev. 0.[42] Around the same time, on December 16, 1999, CP&L also issued Technical Report No. 99-179, which provided a bacterial analysis of the smear of the reddish-brown material on

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38 *Id.* at 5-9.
39 *Id.* at 5-9.
40 *Id.*. at 6-1 – 6-2, Sections 6.1, 6.2, and 6.3.
41 SIA Report, Rev. 2 at 5-9. A copy of this report is included as Attachment 3 to CP&L's ESR No. 99-00266, which is attached hereto as Exhibit 4.

Weld FW-517. The report asserts that bacterial counts were in the lower detectable level of the testing kit, and that no evidence of sulfate-reducing or other nuisance bacterial were detected.[43]

As discussed below, there are a number of significant reasons why neither the SIA Report nor the other evaluations and information prepared by CP&L provide a reasonable assurance that the piping and welds for spent fuel pools C and D is free from damaging corrosion and degradation.

It is vital that the piping and welds for the spent fuel pool cooling system for pools C and D are free from damaging corrosion and degradation. The NRC's regulations dictate it, because the piping and welds have an important safety function. The piping and welds must remain intact to ensure that the decay heat generated by irradiated fuel assemblies can be removed. In addition, even small leaks from this piping and/or welds represents a potential health hazard because the spent fuel pool water contains tritium.[44] The NRC's regulations do not permit the unmonitored and uncontrolled release of tritium from nuclear power plants, even in small amounts. The recent problem with leakage of tritium from the spent fuel pool at Brookhaven, albeit not an NRC licensee, demonstrate the need for taking potential leakage pathways seriously.

1. Unsupported assumptions about the water quality

One of the key assumptions made in both the CP&L Technical Report and the SIA Report is that the water quality in the embedded pipe has been pure, *i.e.*, free from

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42 *Id.* at 6-2 – 6-3. Orange County notes that there is a gap between Rev. 0 and Rev. 2 of the SIA Report, and that it was not provided with any Rev. 1 to the Report. Orange County does not know whether a Rev. 1 exists or whether this is a typographical error.
43 *See* Exhibit 4, attachment 3. As discussed below, there are questionable inconsistencies between the observations made in the SIA Report, Rev. 2, and Technical Report 99-179.

biological contamination, for an extended period of time. The Technical Report asserts that the lines are "filled with demineralized water with measured very low concentrations of chloride, fluoride and sulfate," and that these lines "have been flooded for an extended period of time," thus implying that the lines have been flooded for an extended period with demineralized water.[45] SIA also asserts that the piping "has in effect been exposed to an extended wet lay-up with high purity water (albeit an inadvertent lay-up since no formal lay-up program was ever implemented for the lines connected to the spent fuel pools.)"[46] SIA asserts that it is "conservative" to assume that this "wet lay-up" lasted for about 10 years.[47]

These assumptions have no documented scientific basis. Moreover, even the limited amount of testing that was done is incomplete: CP&L tested only seven of eight embedded lines. Aside from a single set of water tests done in 1999, CP&L does not have a single water test result for the entire period between 1983, when the embedded piping was abandoned, and the present time. All it has is a "snapshot" of the water quality at the current moment. There is simply no documented record of water testing to support any assumption about the longstanding purity of the water in the pipes.

Moreover, CP&L relies on an anecdotal history of flooding of the embedded piping, relying on the assumed compliance with company procedures that would have required draining and rinsing of the pipes at various stages. CP&L has not supported this history with any documentation verifying that such measures were taken. In fact, the

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44 CP&L ESR #99-00266 Rev. 0, at 10, Exhibit 4.
45 Technical Report 99-90 at 2, Exhibit 9.
46 SIA Report, Rev. 2 at 5-4.
47 SIA Report, Rev. 2 at 2-2.

history of the embedded piping shows that there were a number of periods when the piping may have been flooded with less than pure water.

Water was first introduced into the embedded piping in 1979, when hydrostatic testing was conducted.[48] Under CP&L procedures, permissible sources of hydrostatic test water included potable water and lake water.49 Both of these are potential sources of bacterial contamination.

Although CP&L procedures required that the piping be drained and vented subsequent to test completion, and although CP&L indicated to SIA that this was done, the County is not aware of any documentation that these steps were actually completed, or done properly.[50] The NRC reported that:

> Hydrostatic test water quality was specified in CP&L Procedure WP-115, Revision 0, "Hydrostatic Testing of Buried or Embedded Pressure Piping," dated September 19, 1979. WP-115 specified that potable or lake water was to be used for hydrostatic testing. After testing, the procedure required that the pipes be drained. However, the procedure did not specify a time limit for draining of the piping/system. The inspectors were unable to determine from documentation when the piping was drained.[51]

SIA also notes that there is no record that the piping was either rinsed or dried.[52] Thus, there is no record that the piping was drained and cleaned of any bacteria that may have been introduced at the time of the hydrostatic testing. Improper drainage of piping was recognized by the NRC as a potential cause of MIC in IE Information Notice No. 85-56,

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48 SIA Report, Rev. 2 at 2-2.

49 *See* CP&L October 29, 1999 RAI Response, Enclosure 1 at 12.

50 According to SIA, CP&L "indicated that the SFP Piping was drained and vented." SIA Report, Rev. 2 at 2-2. CP&L has not submitted any documentation to the NRC to show that this was done, however.

51 NRC Inspection Report No. 50-400/99-12 at 20. *See* Exhibit 8.

52 SIA Report at 2-2.

which alerts licensees to an incident involving MIC found in a heat exchanger that may have been improperly drained after hydrostatic testing.[53]

The piping would have sat idle, in a potentially contaminated condition, until it was filled again in support of pool liner leak testing.[54] Spent fuel pool C was filled on May 7, 1985, for pool liner leak testing and its drain/rinse was completed on November 4, 1985. Spent fuel pool D was filled on June 11, 1985, for pool liner leak testing and its drain/rinse completed on November 1, 1985.[55]

Subsequent to liner leak testing, there was no reason to introduce water into the pools again until they were filled for purposes of ensuring that there would be no drain-down from pools A and B through pools C and D., sometime around 1989 or 1990.[56] According to SIA, water from pools C and D leaked past plumbers' plugs into the lines, beginning as early as 1989.[57] If the piping was drained after the pool liner leak test, the period of time between the completion of the pool liner leak test and the placement of the pools into service provided ample time for moisture and contaminants to cause damage or deterioration to the piping that was not placed in proper lay-up conditions.

The lines connected to pool C were drained one additional time in 1995-1996, when drain valves were added to the exposed portions of several of the embedded lines. Since that 1995-96 time-frame, the lines refilled with water from the spent fuel pools, as a result of leakage around the plumbers' plugs in the spent fuel pool nozzles. The water samples that were collected and analyzed in the spring of 1999, as discussed above, were

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53 IE Information Notice No. 85-56, Inadequate Environment Control for Components and systems in Extended Storage or Layup (July 15, 1985). *See* Exhibit 5.
54 *See* CP&L October 29, 1999 RAI Response, Enclosure 1 at 12.
55 NRC Inspection Report No. 50-400/99-12 at 20. *See* Exhibit 8.
56 SIA Report at 2-2.
57 SIA Report at 2-2.

samples of this leaked spent fuel pool water that had accumulated in the pipes since the 1995-96 drainage of the lines.[58]

Thus, for the lines that were drained in 1995-96, the results of the water samples taken in 1999 could only, at the very best, indicate the quality of water in the three or four year time period since 1995-96. They also would not reflect isolated locations of bacterial activity in air-filled zone or interface zone, which would not necessarily be located at the drains where samples were taken. As demonstrated above, it is possible that, if company procedures for emptying and cleaning piping were not followed, bacterial contamination from lake water has been present in the piping for some period between 1981 and 1999.

This damage could have occurred in a variety of ways. When the pools were placed in service during the 1989-1990 time frame, water from the spent fuel pools may have leaked past the "plumbers plugs" into the embedded piping. Any such leakage either mixed with the existing stagnant water from the prior period or collected as it partially filled the piping. In any event, because CP&L did not *completely* fill this piping with pure or demineralized water, backed by periodic chemistry sampling of the water to verify its condition, the piping was subjected to three environments:

(a) Water-filled zone: the portion of the partially-filled piping containing the water of uncertain chemistry and origin.

(b) Interface zone: the surface of the water in the partially-filled piping. As demonstrated by a bathtub ring, any impurities having a lower specific gravity than water will float to the water's surface and leave a surface film as the water

58 CP&L October 29, 1999, RAI Response, Enclosure 1 at 12. *See* Exhibit 3a.

evaporates. The interface zone thus experiences a concentration of any such impurities.

(c) Air-filled zone: the portion of the partially-filled piping that does not contain water. The Harris nuclear plant is located in the southeastern United States, a region known for high temperature and humidity during the summer months. In addition, the presence of water in the piping only adds to the humidity levels of the region above the water's surface.

The water-filled zone is an area of concern because, as indicated by Tables 4.1 and 4.2 in the SIA report, the conditions of stagnant water at less than 150 degrees F and pH less than 10 are conditions under which MIC and crevice corrosion can occur. As SIA, Dr. Moccari, and NRC's Mr. Davis have stated, MIC preferentially attacks the welds and heat-affected zones. The water-filled zone of the embedded piping subjected both the field welds and the shop welds to potential MIC attack. In fact, both SIA and Dr. Moccari reported that the remote camera inspection of the field welds revealed signs of degradation. Neither Dr. Moccari nor SIA were able to rule out MIC as the cause of the degradation. However, from Tables 4.1 and 4.2 in SIA's report, it appears that MIC is a leading candidate for the cause agent.

The interface zone (i.e., the surface of the water inside the piping) is an area of concern because it represents a special environment where the water-filled zone meets the air. As described above, the water-filled zone provides all of the conditions necessary for degradation via MIC and crevice corrosion. In addition, the presence of air at the water surface provides an added factor of increased oxygen levels. The presence of oxygen can

promote degradation. It is not apparent from the documentation and the videos that CP&L undertook any effort to locate and evaluate the interface zone in any piping. The air-filled zone is an area of concern because the portions of piping that were not filled with water may also have experienced degradation as a result of humidity in the air. Metal components in long-term lay-up are frequently provided with a nitrogen blanket, as CP&L indicated was done for the Unit 2 spent fuel pool cooling system heat exchangers. The inert atmosphere provided by the nitrogen blanket retards degradation by eliminating the moisture-laden atmosphere. This was not done to protect the embedded piping.

In the absence of such protection, it is reasonable to anticipate that corrosion may have occurred in the embedded piping or the embedded shop welds. The indications of corrosion that *were* found during the videotape inspections also should have prompted CP&L to inquire further. As discussed below, however, CP&L did not inspect the piping or the shop welds.

In summary, CP&L has only one set of water samples, taken in 1999, to account for the environmental condition of the embedded piping over a course of eighteen years. These water samples do not even cover all of the embedded lines. Although CP&L tries to compensate for the lack of historical data by reciting the history of the use of the embedded piping, this recitation presumes that plant procedures requiring draining and rinsing of the pipes at various intervals were followed, without providing any documentation that the procedures actually were followed. There certainly is no factual basis for SIA's assumption of a ten-year "lay-up" in demineralized water, between 1989 and 1999. In fact, as documented above, there were numerous lengthy periods when the piping may have been exposed to bacterial contamination introduced during the initial

hydrostatic tests. Such contamination may be extremely localized and far from the locations where water samples were taken, especially in humid air zones or zones of interface between water and air.

2. Inadequate and inconclusive videocamera inspection of embedded piping and welds

CP&L committed in its license amendment application to conduct a partial inspection of the embedded piping.[47] As it was conceived, the purpose of the program was to validate the qualification of welds for which QA documents had been discarded. The inspection of the embedded field welds for signs of corrosion was an afterthought, poorly executed. Third, the inspection did not follow procedures for identifying and addressing evidence of corrosion and degradation when it was discovered. CP&L has also tried to pass off the inspection as a thorough review of the condition of all the embedded piping as well as the field welds. It is clear, however, that the inspection covered only the field welds, and ignored both the condition of the piping and the shop welds in the embedded piping – even after CP&L discovered the existence of a problematic shop weld. Finally, there is considerable inconsistency in the conclusions reached by CP&L and its experts regarding the significance of corrosion evidence that CP&L found on the field welds.

a. Description of video camera inspection program

According to the Alternative Plan:

> The internal inspection of the embedded field welds is an integral component of the Piping Pedigree Plan. These inspections will be completed prior to post-modification acceptance testing. CP&L has contracted with a specialty vendor to provide remote camera inspections of a substantial portion of the embedded piping and field welds. An inspection procedure will be developed specifically for this activity and will include detailed inspection and acceptance

criteria.[59]

CP&L provided further information regarding the video camera inspections in its April 30, 1999, RAI Response:

> Generalized inspections will be performed on the piping interior for indications of arc strikes, foreign material, high/low, mishandling indications, etc,. Any such indications shall be noted and characterized during the inspection and characterized by Engineering if necessary.[60]

CP&L also developed a procedure for conducting the inspections, Special Plant Procedure SPP-0312T, Rev. 0 (undated), which was followed during the video inspections.[61]

By letter dated October 29, 1999, CP&L informed the NRC Staff that it had conducted video camera inspections on all 15 embedded field welds.[62] CP&L kept a videotape record of the inspections, consisting of eight or more videotapes. These tapes were provided to Orange County in discovery.[63]

CP&L reported in its October 29 correspondence that the videotaped inspection had shown no evidence of fouling or foreign materials, and that there was evidence of only "minor" corrosion:

> Videotapes of the first embedded field welds and associated piping to be visually inspected have been reviewed by CP&L engineering and metallurgical personnel. Aside from localized occurrences of loosely adhering surface film (principally boron deposits from boric acid added to the water), the videotape provides clear evidence that the piping was free from fouling or foreign materials. Where necessary, deposits were removed with pressurized water before the visual inspection. It is the consensus of the reviewers that the condition of the piping and welds is very good. Several inconsequential stains and small pits were noted, indicating that a small amount of minor corrosion may have occurred at some

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59 License Amendment Application, Enclosure 8 at 7.

60 CP&L April 30, 1999 RAI Response, Enclosure 1 at 14. *See* Exhibit 2a.

61 A copy of the procedure is attached as Exhibit 12.

62 CP&L October 29, 1999 RAI Response, Enclosure 1 at 7-8.

63 Because some of the tapes provided to the county were duplicates and were inconsistently labled, Orange County is uncertain of exactly how many tapes were made.

time in the past. Videotapes of all 15 embedded field welds and associated piping have been forwarded to corrosion experts both within CP&L and in the industry.[64]

CP&L also contracted with SIA to evaluate the results of the video inspection.

SIA reported that it found:

> [I]n general, the piping and welds in the embedded SFP Piping were in good condition. However, there were some areas on some welds where the consumable insert was not completely consumed and some areas on most of the welds where the profile was less than idea. The condition of a non-consumed insert was most pronounced on FW-516. Some small linear indications were observed (e.g., FW-65, FW-515, FW-517, FW-518, which appeared to be related to incomplete fusion. No areas were visible from the ID that would suggest that the reduction in thickness approached $t_{min.}$

With respect to MIC, SIA reported that the videotapes revealed:

> no evidence of large mounds of organic material that are typically associated with MIC was present in any of the lines that were examined in the as-found condition. All of those welds and the surrounding pipe work that were examined by the remote visual examination have been very clean, even prior to hydrolasing.
>
> No corrosion nodules or other indications that a localized corrosion phenomenon such as MIC has occurred during the wet lay-up were revealed by the detailed remote visual inspection for all but one of the welds. A few welds exhibited some evidence of minor corrosion; limited to minor staining on those welds, except for FW-517. A very few minor discolored areas, indicative of small pits that may or may not be active any longer, were observed on those welds that exhibited evidence of corrosion. None of those indications suggest the presence of any defects that would compromise the structural integrity of these lines. No crack-like defects were noted in any of the weldments.
>
> The remote visual examination of FW-517 revealed three apparent pits, each defined by a reddish-brown deposit. Two of those indications were located in one short section near the bottom of the pipe; the other near the top.
>
> The reddish-brown deposits and apparent entrance holes in the weld metal of FW-517 could be due to MIC, or could be from another source. In either case, the depth and morphology of the metal loss through the thickness cannot be determined from the remote visual examination of the as-found pipe. The visual examination also cannot provide a determination of whether pitting is active or not, or provide information on the source of the pitting. A definitive determination of the root cause for these small pits would require careful microbioligical and

64 CP&L October 29, 1999, RAI Response, Enclosure 1 at 10.

> chemical sampling of the deposits and the pit interior to augment the visual examination of the as-found condition, then a similarly detailed examination of the area following removal of the deposits to better characterize the pit morphology.
>
> CP&L may choose to attempt to collect the additional information described above in order to define the root cause. However, the location of these small indications and the material's exposure history (numerous unknowns regarding time of first wet-out and possible contamination during remote visual examination and reflooding) will make sample collection and its interpretation difficult at best. The additional sampling and visual inspection may clearly define the depth and extent of the pits (both axially or circumferentially) and provide conclusive evidence of the source of the pitting. The sampling may show that the present chemical and microbiological nature of the deposits is inconclusive, a possible result of the difficulties of sampling or because of the age of the pits.[65]

Despite the observation of corrosion in the piping, including the disturbing evidence of potentially significant corrosion on weld FW-517, SIA concluded that the "overall condition of the welds" is "good to excellent."

b. Internal inconsistency of conclusions

There is significant internal inconsistency in the observations made by SIA and CP&L about the condition of the welds. With respect to the inspection of embedded field weld 2-SF-144-FW-517, CP&L's experts reviewed the tapes and concluded:

> During the initial videotape review of this field weld, three small locations with some rust-colored deposit buildup were observed. ... No pitting or pin holes were visible at either of the locations due to the presence of the deposits. After removing some of the deposits for bacterial characterization, no visible pitting, pin hole, or crack-like defects on the piping underneath the deposits at the 3 o'clock position and at one of the two spots at the 9 o'clock position were observed.[66]

SIA, the independent corrosion expert retained by CP&L reviewed the same tapes for this specific weld and concluded:

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65 SIA Report, Rev. 0 at 5-8 – 5-9. Exhibit 11.

> The remote visual examination of 2-SF-144-FW-517 revealed three apparent pits, each defined by a reddish-brown deposit. ... The reddish-brown deposits and apparent entrance holes in the weld metal of 2-SF-144-FW-517 could be due to MIC, or could be from another source. In either case, the depth and morphology of the metal loss through the thickness cannot be determined from the remote visual examination of the as-found pipe. The visual examination also cannot provide a determination of whether pitting is active or not, or provide information on the source of the pitting.[67]

Thus, the video camera inspection was inadequate and inconclusive because CP&L's experts cannot agree on the substantive issue of whether pitting, a sign of corrosive, is present.

c. scope of video inspection did not include piping

In its license amendment application, CP&L claimed that it would conduct video inspections of both the embedded piping and the field welds in the embedded piping.[68] Dr. Moccari also claimed in his deposition that the piping was inspected, in addition to the field welds.[69] Finally, the SIA Report asserts that:

> Remote visual examination of fifteen embedded field welds (2-SF-8-FW-65 and –66; 2-SF-144-FW-515, -516, and –517; 2-SF-149-FW-408; 2-SF-143-FW-512, -513, and –514; 2-SF-159-FW-518, and –519; 2-SF-1, -2, -4, and –5) *and the piping in six of the eight lines* was done by a CP&L contractor using a high resolution camera mounted to a pipe crawler following draining of those lines.[70]

These assertions that the video inspection covered piping as well as welds are not consistent with a letter written by CP&L to the NRC on October 15, 1999, which claims

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66 CP&L Technical Report No. 99-179, December 16, 1999, "Harris Nuclear Plant - Bacteria Detection in a Deposit Sample and Chemical Analysis of Reddish-Brown Material from the C&D Spent Fuel Pool Cooling Lines," at 4-5. *See* Exhibit 9.

67 SIA Report, Rev. 2, at 5-9. *See* Exhibit 4.

68 License Amendment Application, Enclosure 8 at 7.

69 Transcript of Moccari Deposition at 48.

70 SIA Report, Rev. 2 at 2-3.

that the subject of the video inspection was the 15 field welds.[71] Nor are the assertions supported by the record of what CP&L actually did.

First, CP&L's internal procedure for conducting the video inspections contain acceptance criteria and data sheets that focus on welds, and lack any set of criteria for examining the piping. CP&L followed Special Plant Procedure SPP-0312T in conducting the video camera inspections.[72] Although the title of the Procedure indicates that it covers both welds and piping, and the acceptance criteria within the procedure are entitled "Acceptance Criteria for Embedded Spent Fuel Pool Piping," in fact the criteria are addressed only to the characteristics of welds. These acceptance criteria provide as follows:

> 2. Acceptance Criteria for Embedded Spent Fuel Pool Piping.
>
> Weld surfaces shall be free of the following defects:
>
> - Cracks
> - Lack of fusion
> - Lack of penetration
> - Oxidation ("Sugaring")
> - Undercut greater than 1/32 inch
> - Reinforcement ("Push Through") greater than 1/16 inch
> - Concavity ("Suck Back") greater than 1/32 inch
> - Porosity greater than 1/16 inch
> - Inclusions [73]
>
> **Note: Dimensions obtained should be accurate to within + or – 1/64 inch.**
>
> 3. Indication location (circumferential, side of weld i.e., upstream or downstream, etc.), length, and depth (where applicable) shall be documented on Attachment 1. Other indications, not referenced in paragraph 2 of this Acceptance

71 *See* Letter from Donna B. Alexander, CP&L, to U.S. NRC (October 15, 1999), attached as Exhibit 13.

72 CP&L, Shearon Harris Nuclear Power Plant, Plan Operating Manual, Volume 4, Part 8, Special Plant Procedure SPP-0132T, Rev. 0 (undated). A copy of SPP-0132 is attached as Exhibit __.

73 Page 5, 1st paragraph, CP&L Special Plant Procedure SPP-0312T, Rev. 0 (undated) [Orange County Exhibit #19]

> Criteria, such as arc strikes, foreign material, mishandling, pipe mismatch, pitting, and MIC (microbiologically induced corrosion) shall also be recorded on Attachment 1 and evaluated by the Spent Fuel Pool Responsible Engineer (RE) as necessary. Evaluation will occur through the ER process.

(emphasis in original).

Attachment 1 is a "Remote Visual Examination Data Sheet." The sheet calls for the identification of the "Component ID/Weld Number." There is a section entitled "Reference '0" Location," which has check-off boxes for "TDC of Weld" or "North Side of Weld." Thus, the Data Sheet is set up to record information about welds, not piping. In addition, CP&L filled out and submitted to the NRC Staff exactly 15 Remote Visual Examination Data Sheets – one for each field weld. Each of the Data Sheets records data for the inspection of a single weld, and does not address the condition of the piping between the welds. Although the narrative on the videotapes indicates that CP&L observed foreign debris in the piping, the weld data sheets do not contain this information; instead, they focus exclusively on the welds.74

Second, the conclusion section of SIA's report characterizes the video camera inspection as "[d]etailed visual examination results of *embedded field welds.*"[75] Moreover, while SIA bases its conclusions about the integrity and condition of the welds on the remote visual inspections, it makes no attempt to relate the visual inspections to its conclusions about the condition of the piping itself.[76] Instead, SIA bases its conclusions about the integrity of the piping on the assumed "benign" water conditions, the lack of

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74 *See* completed data sheets, attached to ESR 96-00266. Exhibit 4.
75 SIA Report, Rev. 2 at 6-1.
76 SIA Report, Rev. 2 at 6-1 through 6-3.

pitting on the *outside of exposed* piping, and SIA's opinion that pitting does not affect the structural integrity of piping.[77]

Third, the NRC concedes that CP&L's video camera inspection did not examine the piping: "The licensee performed a remote enhanced visual examination of 15 embedded field welds from inside the stainless steel SFP C and D piping."[78]

Finally, a review of five of the videotapes prepared by CP&L confirms that the video inspection examined only welds.[79] The camera moves from one weld to another, without attempting to examine the piping that lies between each weld. The commentary is also focused almost exclusively on the welds. Although there are some comments about debris that has collected in the bottom of the piping, there is no attempt to examine the piping itself, or systematically identify locations where debris has collected.

CP&L and various reviewers have claimed that it is not necessary to examine the piping, because any MIC that develops would attack the welds before it attacked the piping. This position is not justifiable, for a number of reasons. First, as discussed above, CP&L is required to meet the standards of Appendix B to Part 50, which require it to have a program for ensuring the integrity of the piping that it uses for safety systems. Under the circumstances, CP&L must affirmatively demonstrate that the embedded piping meets its own procurement standards of being clean and free from corrosion; it is not conservative or sufficient to offer an educated guess that this is the case. Second, the

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77 SIA Report, Rev. 2 at 6-2.

78 NRC Inspection Report No. 50-400/99-12 at 22. *See* Exhibit 8.

79 Copies of the following videotapes are provided as Exhibits: CPL-147, CTS Power Services, 1st Vist 6/99-Non-Clear "C" Pipe (Exhibit 16); CPL-148, 99-ADUNZ WR/JO Weld 2 SF-8-FW-66 I.D. (6/24/99) (Exhibit 17); CPL-153, Visual Inspection of Welds, CTS Power Services, 2-SF-8-FW-66, 2-SF-8-FW-65 (Exhibit 18); CPL-155, Weld Hydrolasing (Exhibit 19); CPL-158, Weld Cleaning 2-SF-8-FW-65 & 66 (Exhibit 20).

videotape inspections did yield some evidence indicating possible corrosion, which should have caused CP&L to examine the condition of the piping. Finally, as discussed below, the videotaped inspections did not include the shop welds, and therefore no conclusions can be reached about the condition of those welds.

d. scope of video inspection did not include shop welds

According to SIA, there are 200 welds in the existing piping for pools C and D, including 160 shop welds and 40 field welds.[80] Shop welds are welds made in the "shop," i.e., before installation. Field welds are made at the location where the pipe spools are installed.

CP&L failed to inspect these shop welds, even after the video inspection of the field welds identified a shop weld for which there appeared to be welding problems. During the remote camera inspection of the field welds, the contractor inadvertently positioned the camera at a shop weld instead of at the target field weld, 2-SF-8-FW-66. Mr. Lochbaum transcribed the following remarks of the camera operator from the videotape:

> "This weld here to the right appears to be a shop weld. It's not on any of the drawings. [...] We're not sure where it came from."
>
> * * * *
>
> "As you can see there appears to be a lot of grinding in here. Therefore, this cannot be our field weld. The one we just passed must have been the field weld and this here must have been the shop weld. We see a couple spots there was a lack of fusion like right here and again up here a little further there was some more."
>
> * * * *
>
> "Earlier when we were looking up at this point we saw a little bit of a push-through. It looked like where it started and stopped. From this angle it appears that what this is."[81]

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80 License Amendment Application, Enclosure 8 at 5.

81 CP&L videotape labeled CPL-148, 6-24-99 99-ADUNZ WR/JO / Weld 2 SF-8-FW-66 I.D. Exhibit 17.

While the remote camera inspections were intended to determine the adequacy of the field welds within the embedded piping, the discovery of potential lack of fusion and push-through in a shop weld should have prompted further evaluations by CP&L. CP&L's Special Plant Procedure SPP-0312T required indications such as lack of fusion, lack of penetration, etc. to be recorded on Attachment 1 to the procedure. However, to Orange County's knowledge, CP&L did not make any such record for the single shop weld that was mistakenly examined during the remote camera inspection, and on which CP&L noted welding anomalies.[82] CP&L should have conducted an evaluation that not only ascertained the quality level of the subject shop weld, but identified other shop embedded welds and examined them for their adequacy of construction and condition. Mr. Lochbaum reviewed the videotapes of five of the remote camera inspections and this shop weld was the only weld examined. Moreover, this shop weld was only inspected by sheer accident.

e. video inspection failed to follow procedures for identifying foreign material

CP&L also failed to follow its own procedure for identifying any foreign materials or other anomalies found during the inspection of the piping. For instance, Special Plant Procedure SPP-0312T states that indications of defects or problems "such as arc strikes, foreign material, mishandling, pipe mismatch, pitting, and MIC (microbiologically induced corrosion)" must be recorded on Attachment 1 to the Procedure and evaluated by the Spent Fuel Pool Responsible Engineer (RE) as necessary. Evaluation will occur through the ESR process.[83]

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82 *See* Weld Data Sheets, Exhibit 4.

83 CP&L Special Plant Procedure SPP-0312T, Rev. 0 (undated), attached as Exhibit 12.

CP&L's inspection of the piping also should have been guided by the provisions of ESR No. 95-00425, CP&L's internal procedures for construction and acceptance testing of equipment serving pools C and D. ESR No. 95-00425 provides in pertinent part that for corrosion-resistant alloys:

> The surface shall appear metal clean and free of organic films and contaminants when examined in accordance with para. 7.2.1 of ASTM A 380-78, practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems, except light deposits of atmospheric dust are permissible and shall show no evidence of deleterious contamination when subjected to the wipe test of para. 7.2.2 of ASTM A 380-78.[84]

These procedures, taken together, required CP&L to identify and investigate any foreign materials, contaminants, or evidence of corrosion found in the piping or on the welds.

Contrary to these procedures, CP&L ignored signs of such contamination and corrosion, and eliminated the evidence rather than investigating it. CP&L claims that the surface film observed on welds during the initial remote camera inspections, which prompted subsequent hydrolasing activities, is "principally boron deposits from boric acid added to the water."[85] But, there is no hard evidence to support this belief, however sincere or widely shared. For example, CP&L expert witness Dr. Ahmad A. Moccari testified during his deposition by Orange County on October 19, 1999, that no effort was made to analyze the surface film seen on the welds:

> Q. Did you see something else? [referring to review of videotape of weld inspections]
> A. Some surface film, but not algae. Algae needs oxygen, they need sun. How can you see algae in a pipe that doesn't see sun?
> Q. Surface film. What causes surface film?
> A. A deposit from whatever is in the water.[86]

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84 CP&L ESR No. 9500425, Section 12, excerpt attached as Exhibit 14.
85 CP&L October 29, 1999, RAI Response, Enclosure 1 at 10. *See* Exhibit 3.a.
86 Moccari Deposition, Tr. at 55.

* * *

Q. Can pure water or demineralized water cause surface film?
A. Pure water, demineralized water, no. But that's not what they have there.
Q. But that's not –
A. There have something else in the water. Boron. Boric acid, yes.87

Q. Was any chemical analysis performed of the surface film to verify that it was boron precipitate?
A. I'm not aware of it, no.[88]

Mr. R. Steven Edwards, the CP&L project manager overseeing the effort to activate spent fuel pools C & D at Harris, confirmed in his deposition that CP&L performed no analysis to confirm this assertion.[89] As such, it merely constitutes a hunch.

Further evidence of CP&L's inadequate "engineering evaluation" appears in the technical report prepared by Dr. Moccari following his analysis of the water samples collected from the Unit 2 spent fuel pool cooling system piping:

> It should be noted that the presence of microbiologically influenced corrosion (MIC) and halogen associated localized corrosion are not considered likely in the Harris Nuclear Plant C&D spent fuel pool cooling lines given that the piping is filled with demineralized water with measured very low concentrations of chloride, fluoride, and sulfate. Furthermore, since these lines have been reportedly flooded for an extended period of time, the existence of microbial activity in an aggressive form would be expected to have been evidenced by this time in the form of material degradation which most likely would be visible by eternal leakage. No such incidents have been reported by plant personnel.[90]

In his technical report, Dr. Mocarri stated that "the existence of microbial activity in an aggressive form would be expected to have been evidenced by this time in the form of

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87 Mocarri Deposition, Tr. at 56.
88 Mocarri Deposition, Tr. at 56-57.
89 Deposition of R. Steven Edwards, Tr. at 28 (October 14, 1999). Relevant excerpts are attached as Exhibit 15.
90 CP&L Technical Report 99-90. *See* Exhibit 9.

material degradation...".[91] During his deposition on October 19, 1999, Dr. Mocarri described finding material degradation during his review of the videotapes:

> Q. When you look at the welds on the videotape, can you see any pinhole leakage, using the camera?
> A. Yes. You can see.
> Q. Did you see that in the inspection?
> A. I saw one pinhole.
> Q. Where was it?
> A. It was adjacent to the weld.
> Q. What causes pinhole leaks?
> A. Chemical corrosion, MIC, or it could have been a defect. We don't know.[92]

Orange County's expert witness for this contention, Mr. Lochbaum, reviewed the videotapes made by CP&L during the field weld hydrolasing. Assuming that the videotapes accurately represent the scope of the hydrolasing effort, Mr. Lochbaum concluded that the cleaning effort had been largely confined to the neighborhood of the field welds themselves. The videotapes made following the hydrolasing confirm that this effort successfully removed from surface film from the welds. However, the videotapes do not demonstrate that all of the interior surfaces of the embedded piping are free from organic films and contaminants "except for light deposits of atmospheric dust" as required by CP&L's own standard. Even if the observed surface film did result from boron precipitation – which CP&L has not confirmed by chemical analysis – it does not qualify as a light deposit of atmospheric dust.

Mr. Lochbaum transcribed these statements recorded on the tapes by the camera operator:

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91 CP&L Technical Report 99-90.
92 Mocarri Deposition, Tr. at 66-67.

"We're looking, this is our horizontal, horizontal pipe looking towards the vertical elbow that brings us up towards the strainer. You see there appears to be something in the bottom of the pipe. [...] It's probably just some form of debris."

* * *

"Just appears to be a pile of scale, came down from the pipe, probably when you drained this line out, it worked its way down and just puddled up here at the bottom of the elbow."[93]

* * *

"Starting to get a little bit of a haze on the piping itself from the residue [...] again that's buildup of the residue and stuff."

* * *

"The picture looks a little fuzzy, but it's not. It's actually, ah, the residue buildup."

* * *

"Again, we got those same thin black lines that appears to be ah, some, just, the way that the lines of the scale and residue have grown in here."

* * *

"Again, you can see, ah, some of the scale that's in here, the red residue that's from the growth, the stagnant water in here."

* * *

"Okay, we're looking at this from the top view down. As you can see the way, the way the stuff flows downhill in this pipe there's a lot more, ah, buildup on this end."

* * *

"Center of your screen is the weld. You've got a lot of crud that ran down this."[94]

As discussed above, CP&L's procedure SPP-0312T required foreign material to be noted (i.e., recorded on Attachment 1) if it was observed during the video inspection. The

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93 CP&L Videotape labeled: CPL-148, 6-24-99 99-ADUNZ WR/JO / Weld 2 SF-8-FW-66 I.D. Exhibit 17.

"debris," "pile of scale," "residue and stuff," "lines of scale," and "crud" observed by the camera operators during the inspections would seem to constitute foreign material. Yet, the only finding mentioned by CP&L was a single weld anomaly on a field weld. CP&L simply did not record this information.

Mr. R. Steven Edwards, CP&L's project manager overseeing the efforts to activate spent fuel pools C & D, testified about foreign material during his deposition by Orange County on October 19, 1999:

> Q. What is meant by the term "foreign material" in paragraph 3 [of CP&L procedure 0312T, Orange County Exhibit 19]?
> A. Foreign material would be any item that you would not generally anticipate being there.
> Q. Would it include slime or any other kind of surficial coating?
> A. No. It would include things like debris, that sort of thing.[95]

Clearly, 'pile of scale,' 'residue and stuff,' 'lines of scale,' and 'crud' are 'debris' or 'that sort of thing,' and is also the kind of material that one "would not generally anticipate being there." Moreover, these materials cannot reasonably be considered "light deposits of atmospheric dust," which is CP&L's own standard for the condition of piping.[96] Yet, CP&L did not mention these foreign materials in its evaluation of the remote camera inspections. In addition, CP&L did not initiate activities to hydrolase the remainder of the interior piping surfaces.

In summary, CP&L's assessment of possible degradation within the embedded piping of the Unit 2 spent fuel pool cooling system is seriously flawed in two ways:

First, CP&L focused exclusively on the condition of the 15 field

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94 CP&L Videotape labeled: CPL-147, 1999 CTS Power Services / 1st Vist 6/99 - Non Clear "C" Pipe (Exhibit 16).
95 Edwards Deposition, Tr. at 22. Exhibit 15.

welds within the embedded piping. CP&L did not examine the condition of the vendor (or shop) welds within the embedded piping or the condition of the piping itself. While corrosion mechanisms such as MIC may be more likely to attack welds before attacking piping, thereby justifying emphasis on the weld conditions, it is non-conservative and hence unacceptable to concentrate on 15 field welds at the exclusion of the vendor welds and the piping. CP&L also glossed over internal inconsistencies in its experts' reports, and ignored indications that it should look beyond the 15 field welds at the rest of the system.

Second, CP&L's acceptance of the degradation observed on some of the 15 field welds is based on the determination that the structural integrity is not challenged by the corrosion damage. The leak tightness of the piping, which is another essential attribute for the piping, was improperly ignored by CP&L and its contractor. CP&L's Dr. Moccari reported observing a pinhole that may have been caused by MIC, but concluded that no effort to determine its cause or extent were necessary. Likewise, SIA reported that there were signs of MIC attack, but could not ascertain its extent or determine if was an active or inactive attack.

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96 *See* Exhibit 14.

VI. CONCLUSION

For the foregoing reasons, CP&L has failed to demonstrate that its License Amendment Application meets the applicable and appropriate requirements for issuance of an operating license, in that CP&L has not shown that it has maintained the cooling system for pools C and D in compliance with the requirements of Appendix B to 10 C.F.R. Part 50. Moreover, CP&L has failed to demonstrate that the piping is in a condition that meets NRC quality assurance requirements and will provide adequate protection to public health and safety.

Orange County has demonstrated that the License Amendment Application must be rejected as a matter of law. If the Board declines to reject the application as a matter of law, it should find that Orange County has raised material and substantial issues of law and fact, and order the parties to proceed to an adjudicatory hearing on Contention TC-3.

Respectfully submitted,

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I, David A. Lochbaum, declare under penalty of perjury that the technical facts presented in the above Summary and Sworn Submission are true and correct to the best of my knowledge and that all expressions of opinion regarding technical matters are based on my best profession judgment.

David A. Lochbaum

January 4, 2000

LIST OF EXHIBITS TO ORANGE COUNTY'S SUMMARY AND SWORN SUBMISSION REGARDING QUALITY ASSURANCE ISSUES

1. Declaration of David A. Lochbaum In Support of Orange County's Summary and Sworn Submission Regarding Contention TC-2 (Inadequate Quality Assurance)

2. Letter from Donna B. Alexander, CP&L, to U.S. NRC (April 30, 1999), Re: Response to NRC RAI

2.a. Enclosure 1 to 4/30/99 RAI Response (Response to RAI)

2.b Enclosure 5 to 4/30/99 RAI Response (CP&L Construction QA Manual) (excerpts)

2.c. Enclosure 14 to 4/30/99 RAI Response (CP&L Operating QA Manual) (excerpts)

2.d. Enclosure 16 to 4/30/99 RAI Response (Supplemental Quality Assurance Requirements for the Design Change Packages Associated with Completion of the Units 2 & 3 Spent Fuel Cooling System)

3. Letter from Donna B. Alexander, CP&L to U.S. NRC (October 29, 1999) re: Response to RAI

3.a Enclosure 1 to 10/29/99 RAI (RAI Response)

3.b Enclosure 3 to 10/29/99 RAI Response (Chemistry Sample Data Sheets)

4. ESR # 96-00266, Rev. 0 re: Evaluate Unit 2 & # SFP Cooling Embedded Piping

5. IE Information Notice No. 85-56, Inadequate Environment Control for Components and Systems in Extended Storage or Layup (July 15, 1985)

6. NRC IE Information Notice No. 85-30, Microbiologically Induced Corrosion of Containment Service Water system (April 19, 1985)

7. NRC Information Notice No. 94-38, Results of a special NRC Inspection at Dresden Nuclear Power Station Following a Rupture of Service Water Inside Containment (May 267, 1994)

8. Letter from Kerry D. Landis, NRC, to James Scarola, CP&L, re: NRC Inspection Report No. 50-400/99-12 (December 28, 1999)

9. CP&L Technical Report 99-90, re: Harris Nuclear Plant – Bacteria Detection in Water from the C&D Spent Fuel Pool Cooling Lines

10. Transcript of Deposition of Dr. Ahmad A. Moccari (October 19, 1999) (excerpts)

11. Structural Integrity Associates, Inc., Report No. SIR-99-127, Rev. 0, Evaluation of Embedded Welds in Spent Fuel Piping at Harris Nuclear Plant (December 7, 1999)

12. CP&L Special Plant Procedure SPP-0312T, Rev. 0

13. Letter from Donna B. Alexander, CP&L, to US NRC (October 15, 1999)

14. CP&L ESR No. 95-00425, Rev. 0, Installation Section, Testing Requirements (Section 12)

15. Transcript of Deposition of R. Steven Edwards (October 19, 1999) (relevant excerpts)

16. Videotape: CP&L 147, CTS Power Services, 1st Vist 6/99-Non-Clear "C" Pipe

17. Videotape: CPL-148, 99-ADUNZ WR/JO Weld 2 SF-8-FW-66 I.D. (6/24/99)

18. Videotape: CPL-153, Visual Inspection of Welds, CTS Power Services, 2-SF-8-FW-66, 2-SF-8-FW-65

19. Videotape: CPL-155, Weld Hydrolasing

20. Videotape: CPL-158, Weld Cleaning 2-SF-8-FW-65 & 66

CONTENTION TC-3: EXHIBIT 1

Declaration of David A. Lochbaum In Support of Orange County's Summary and Sworn Submission Regarding Contention TC-2 (Inadequate Quality Assurance)