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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

In the Matter of)
)
NORTHEAST NUCLEAR ENERGY)
COMPANY)
Millstone Nuclear Power Station, Unit No. 3)
_____)

Docket No. 50-423 – LA-3

ASLBP No. 00-771-01-LA

ORANGE COUNTY'S AMICUS BRIEF ON REVIEW OF LBP-00-26

**Submitted on behalf of the Board of Commissioners of
Orange County, North Carolina by:**

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ORANGE COUNTY’S AMICUS BRIEF ON REVIEW OF LBP-00-26

I. INTRODUCTION

Pursuant to the Commission’s order in CLI-01-01-03, Memorandum and Order (January 17, 2001), the Board of Commissioners of Orange County, North Carolina (“Orange County”) hereby files an *amicus* brief on review of LBP-00-26, Memorandum and Order (Adopting Agreed License Condition, Denying Request for Evidentiary Hearing on Other Issues, and Terminating Proceeding (October 26, 2000)). This brief is supportive of and complementary to the brief filed by the intervenors/appellants, the Connecticut Coalition Against Millstone and the Long Island Coalition Against Millstone (“CCAM/CAM”).¹

II. FACTUAL AND PROCEDURAL BACKGROUND

In this appeal, CCAM/CAM have challenged the Licensing Board’s interpretation in LBP-00-26 of General Design Criterion (“GDC”) 62 with respect to the scope of permissible criticality prevention measures. *See* 10 C.F.R. Part 50, Appendix A. In reaching its decision, the Board relied in part on a Licensing Board decision in a similar case, in which Orange County is the intervenor. *Carolina Power & Light Co* (Shearon Harris Nuclear Power Plant), LBP-00-12, 51 NRC 247 (2000).

¹ Orange County agrees with the arguments set forth by CCAM/CAM in their brief, including

The circumstances of the spent fuel pool expansion proceeding addressed in LBP-00-26 are similar to the circumstances addressed in LBP-00-12. In both cases, the licensees propose to increase the density of spent fuel pool storage. At Harris, Carolina Power & Light Company (“CP&L”), seeks to activate two previously-abandoned spent fuel pools (labeled “C” and “D”), where it plans to install high-density racks for storage of spent fuel from Harris and other nuclear power plants owned by CP&L.²

Due to the proposed increase in the density of fuel storage at Millstone and Harris, physical means of criticality prevention such as low-density racking and the installation of solid neutron-absorbing materials in the racks would not, by themselves, be effective to prevent criticality. Thus, the licensees proposed to rely in large part on administrative measures for the prevention of criticality. In the case of the Millstone plant, these measures consist of taking credit for burnup/enrichment and decay time. CP&L proposes to take credit only for burnup/enrichment.

their response to the Commission’s question at page 7 of CLI-01-03.

2 Pools A and B now have a combined capacity of 1,128 PWR spent fuel assemblies and 2,541 BWR assemblies. The proposed license amendment would allow CP&L to use pools C and D for storage of an additional 1,952 PWR spent fuel assemblies and 2,763 BWR assemblies.

In pools A and B, CP&L currently uses a combination of physical measures to prevent criticality during normal operation: by spacing the fuel assemblies at a nominal center-to-center distance apart of 10.5 inches for PWR assemblies and 6.25 inches for BWR assemblies; and by incorporating solid neutron-absorbing materials in the racks. For pools C and D, CP&L proposes to store the PWR spent fuel assemblies much closer together, at a nominal center-to-center distance apart of 9.017 inches. This spacing is close to the smallest distance that is physically possible for intact PWR fuel, because the PWR fuel assemblies used in the Harris reactor have a square cross-section that is 8.43 inches wide. Under such high-density conditions, physical measures such as distance between fuel assemblies and solid neutron-absorbing materials will not be sufficient to prevent criticality. Therefore, in order to prevent criticality among the PWR assemblies, CP&L proposes to rely on administrative measures that would limit the combination of burnup and enrichment levels in pools C and D to an “acceptable range.” See Orange County’s Detailed Summary of Facts, Data and Arguments and Sworn Submission on Which Orange County Intends to Rely at Oral Argument . . . With Respect to Criticality Prevention Issues (Contention TC-2) at 15 (January 4, 2000), *citing* Enclosure 5 to CP&L’s License Amendment Application (hereinafter “Orange County’s Summary”). CP&L’s proposed spent fuel pool expansion and criticality prevention measures are described in further detail in Orange County’s

Like CCAM/CAM, Orange County gained admission of a contention challenging the lawfulness of CP&L's proposed license amendment under GDC 62.³ In the subsequent Subpart K proceeding, Orange County presented legal argument that the plain language and regulatory history of GDC 62 demonstrate the Commission's intention to restrict means of criticality prevention to measures that are fundamentally physical in nature, such as the use of low-density storage racks and solid neutron-absorbing material; and to preclude reliance on fundamentally procedural measures such as burnup/enrichment control. *See* Orange County Summary at 20-28. The County also argued that later Commission rulemakings regarding criticality issues do not contradict these basic requirements of GDC 62; and that contrary guidance in NRC regulatory guides and Staff memoranda has no binding effect. *Id.* at 28-38. Finally, Orange County presented evidence that the NRC Staff has kept no records regarding the potential for criticality accidents when reliance is placed on administrative measures rather than physical measures; and thus there is no basis for concluding that reliance on administrative measures for criticality prevention provides an adequate margin of safety.

Summary at 13-16.

³ *See* LBP-99-25, 50 NRC 25 (1999). As admitted by the Licensing Board, Orange County's Contention TC-2 charges that:

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

See 50 NRC at 35. Basis 1 of the contention asserts that: "CP&L's proposed use of credit for burnup to prevent criticality in pools C and D is unlawful because GDC 62 prohibits the use of

In fact, Orange County's review of NRC documents shows that fuel mispositioning, involving placement in a pool of one or more fuel assemblies with inappropriate burnup/enrichment or age, has occurred on a number of occasions. *See* Orange County Summary at 38-41 and Appendix B thereto.

In LBP-00-12, the Licensing Board rejected Orange County's arguments and ruled that GDC 62 encompasses the administrative criticality prevention measures proposed by CP&L. 51 NRC at 259-60. The County filed a petition for review, but it was denied on the ground of prematurity.

ARGUMENT

III. LBP-00-12 DOES NOT SUPPORT LBP-00-12 BECAUSE IT IS BASED ON LEGAL ERROR.

This appeal concerns the interpretation of General Design Criterion 62, which provides as follows:

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

10 C.F.R. Part 50, Appendix A. In LBP-00-26, the Licensing Board explicitly adopted "the same legal conclusion" reached by the Licensing Board in LBP-00-12 regarding the appropriate interpretation of GDC 62.⁴ Slip op. at 43.

In LBP-00-12, the Board rejected the County's argument that the language of GDC 62 clearly precludes reliance on administrative measures for criticality prevention.

administrative measures, and the use of credit for burnup is an administrative measure." The Board found that this first basis raises "essentially a question of law." 50 NRC at 36.

⁴ The emphasis of the discussion in LBP-00-26 is somewhat different than LBP-00-12, because it focuses on the plain language of GDC 62, while LBP-00-12 focuses on the regulatory history of GDC 62. However, it appears that LBP-00-26 generally relies on the analysis provided by the Board in LBP-00-12.

51 NRC at 259. Resorting for guidance to the rulemaking history of GDC 62, the Board found that it supported CP&L's and the NRC Staff's view that administrative measures were countenanced by GDC 62. *Id.* The Board also found that 10 C.F.R. § 50.68, promulgated after GDC 62, supported a broad interpretation of the measures permitted by GDC 62; and that this broad interpretation was supported by NRC Staff guidance. *Id.*, 51 NRC at 260. As discussed below, these conclusions are legally erroneous.

A. LBP-00-12 Erroneously Concluded That There Is No Valid Basis for Distinguishing Between Physical and Non-Physical Systems and Processes for Criticality Prevention.

In support of its holding that GDC 62 does not preclude reliance on ongoing administrative measures such as taking credit for burnup/enrichment, the Licensing Board found that "there is no clear-cut demarcation to differentiate the administrative and nonadministrative aspects of the criticality control procedure/processes at issue here so as to place any of them either inside or outside" the "label" of "physical procedures or systems." 51 NRC at 259. In reaching this conclusion, the Board appears to have seized on Orange County's concession that there is some overlap between physical measures and ongoing administrative measures. *See* Orange County Summary at 21-24. As Orange County has demonstrated, however, there are fundamental differences between physical and administrative measures:

While physical systems and processes entail some administrative controls, these are one-time controls that generally are complete before the system or process is put to use. By contrast, the use of restrictions on fuel burnup/enrichment or fuel age, or reliance on the presence of soluble boron, as means of criticality suppression will require ongoing administrative controls. This requirement can never be relaxed, and the controls must be implemented on a completely reliable basis. Over time, ongoing administrative controls of this kind will have a much higher cumulative probability of failure than one-time controls.⁵

⁵ *See also* transcript of the Subpart K oral argument at 226-28, 261-62 (January 21, 2000), which further amplifies the basis for distinguishing between physical and

Orange County Summary at 23-24. Criticality prevention through spacing in racks requires one-time administrative actions of building, installing, and inspecting the racks. This stands in sharp contrast with criticality prevention through burnup control, which requires repeated and ongoing human actions to make sure that fuel is not placed in the wrong racks. The fact that administrative measures may have minor or tangential physical features does not alter the basic difference between physical and administrative measures. The Board grossly oversimplified this issue, and ignored the conceptual distinction set forth by Orange County.

Equally importantly, the Board failed to explain how its broad interpretation of GDC 62 could be squared with the language in GDC 62. By using the adjective “physical” to describe “systems and processes” acceptable for criticality prevention, the Commission obviously intended to exclude non-physical systems and processes. Otherwise, it would have simply instructed license applicants to prevent criticality by any means possible. In LBP-00-12, the Board offered no explanation whatsoever as to what types of criticality prevention measures the Commission intended to forbid in GDC 62. As a result, the Board read the word “physical” out of the regulation. Under LBP-00-12, all criticality prevention measures are permitted, regardless of their nature.

B. The Regulatory History of GDC 62 Shows That the Commission Intended to Preclude Reliance on Administrative and Procedural Measures for Criticality Prevention.

In LBP-00-12, the Licensing Board found that the plain language of GDC 62 was not clear enough to support a definitive interpretation, and therefore turned to the rulemaking history of GDC 62. In the Board’s view, the regulatory history supports a

administrative criticality prevention measures.

broad interpretation of GDC 62. 51 NRC at 259-60. The Board's reading of the history of GDC 62 is erroneous, however, because it ignores significant events in that history which demonstrate the Commission's intent to preclude reliance on "procedural controls," *i.e.*, ongoing administrative measures. Early in the rulemaking process, and in the proposed rule, the Commission considered language favoring physical systems or processes, but permitting procedural measures. In response to comments, however, the Commission removed the reference to procedural measures, and established a clear requirement that physical systems and processes must be used.

The history of the rulemaking is as follows:

1. Pre-rulemaking documents

To Orange County's knowledge, a set of draft General Design Criteria first appeared as an attachment to an Atomic Energy Commission ("AEC")⁶ press release of November 22, 1965, entitled "AEC seeking public comment on proposed design criteria for nuclear power plant construction permits."⁷ The attachment included draft Criterion 25, which proposed the following language relating to prevention of criticality in fuel handling and storage facilities:

The fuel handling and storage facilities must be designed to prevent criticality and to maintain adequate shielding and cooling for spent fuel under all anticipated normal and abnormal conditions, and credible accident conditions. Variables upon which health and safety of the public depend must be monitored.

During the following year, the AEC continued to revise the language of the proposed GDC in response to comments made by AEC staff and by members of the Advisory Committee on Reactor Safeguards ("ACRS"). A revised draft of October 6, 1967, prepared by the AEC, contained draft Criterion 10, which stated:

⁶ The Atomic Energy Commission was the predecessor agency to the NRC.

Possibilities for inadvertent criticality must be prevented by engineered systems or processes to every extent practicable. Such means as geometric safe spacing limits shall be emphasized over procedural controls.⁸

The same language appeared again in an October 20, 1966 draft, which was attached to a letter of October 25, 1966 from J.J. DiNunno of the AEC to David Okrent of the ACRS.⁹

Another draft of a GDC for criticality prevention appears as a February 6, 1967, attachment to a letter from J. J. DiNunno of the AEC to Nunzio J Palladino of the ACRS, dated February 8, 1967.¹⁰ In this draft, the potential for criticality in fuel handling and storage facilities was addressed by Criterion 61, which stated:

Possibilities for criticality in new and spent fuel storage shall be prevented by physical systems or processes to every extent practicable. Such means as favorable geometries shall be emphasized over procedural controls.

2. Proposed GDC for criticality control

On June 16, 1967, the AEC Director of Regulation proposed a set of draft GDCs to the AEC Commissioners.¹¹ The potential for criticality in fuel handling and storage facilities was addressed by draft Criterion 66, which stated:

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

Shortly thereafter, this language appeared in the Commission's notice of proposed

7 The Press Release is attached to Orange County's Summary as Exhibit 7.

8 Internal AEC memorandum from G.A. Arlotto to J.J. DiNuuno and Robert H. Bryan (October 7, 1966), and attached Revised Draft of General Design Criteria for Nuclear Power Plant Construction Permits (October 6, 1966), attached to Orange County's Summary as Exhibit 8.

9 The October 25, 1966, letter and attached draft are attached to Orange County's Summary as Exhibit 9.

10 The February 8, 1967 letter and attached draft are attached to Orange County's Summary as Exhibit 10.

11 Note by the Secretary, W.B. McCool, to AEC Commissioners re: Proposed Amendment to 10 CFR 50: General Design Criteria for Nuclear Power Plant Construction Permits (June 16, 1967). The Note and relevant excerpts from Appendix B to the Note are attached to Orange County's Summary as Exhibit 11.

rulemaking for the General Design Criteria, 32 Fed. Reg. 10,213 (July 11, 1967).¹² Thus, throughout the early development of the GDC for criticality control, the concept of procedural controls was included in the language of the criterion.

3. Comments on the proposed rule

Comments on the proposed rule show persistent effort by the nuclear industry to influence the evolution of many of the GDCs, but comparatively little concern about the criterion that became GDC 62. The Commission did, however, receive an influential comment on criticality prevention from the Nuclear Safety Information Center, Oak Ridge National Laboratory (ORNL).¹³ The ORNL commented as follows:

We do not understand the implication of ‘or processes’ at the end of the first sentence, nor do we believe that it is practical to depend upon procedural controls to prevent accidental criticality in storage facilities of power reactors. Hence, the last sentence of this criterion should be changed to read as follows: ‘Such means as geometrically safe configurations shall be used to insure that criticality cannot occur.’¹⁴

On July 15, 1969, the AEC prepared a set of revisions to the GDC, based on comments by the ACRS and the nuclear industry. As discussed in the accompanying cover letter, a major difference between the proposed GDC and the revised GDC was that the revised GDC “[e]stablish “minimum requirements” for water-cooled reactors, whereas the published criteria were “guidance” for all reactors.¹⁵ The revised GDC included GDC 62, entitled “Prevention of Criticality in Fuel Storage and Handling:”

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

¹² A copy of the Federal Register notice is attached to Orange County’s Summary as Exhibit 12.

¹³ ORNL’s comments on the proposed rule were contained in an attachment to a letter of September 6, 1967 from William B. Cottrell of ORNL to H. L. Price of the AEC, attached to Orange County’s Summary as Exhibit 13.

¹⁴ *Id.*, Attachment containing “Specific Comments” at 11.

¹⁵ Letter from Edson G. Case, AEC, to Dr. Stephen H. Hanauer, ACRS (July 23, 1969), enclosing General Design Criteria for Nuclear Power Units (July 15, 1969), attached to Orange County’s Summary as Exhibit 14.

On June 4, 1970, the AEC prepared another revision to the GDC, containing the identical language of GDC 62 that had been prepared on July 15, 1969. This revision was circulated to other members of the AEC and the Atomic Industrial Forum (AIF), a nuclear industry trade organization.¹⁶ Although the AIF recommended substantial changes to other GDCs contained in the revised draft, it accepted the new draft GDC 62 without any proposed alteration.

4. The Final Rule

On February 20, 1971, the AEC published the General Design Criteria in final form.¹⁷ The introduction to the GDC's now characterized them as "minimum requirements" for the design of nuclear power plants, rather than "guidance" as had been proposed. In addition, the final rule included GDC 62, which provided that:

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

The final rule removed the language in the proposed rule that had included "procedural controls" in the set of acceptable measures for controlling criticality. Instead, "physical systems or processes" became the only acceptable means of criticality control. Moreover, geometrically safe configurations were clearly identified as the "preferred" type of physical system or process, in lieu of "emphasized" controls. It can be assumed that ORNL's comment regarding the impracticality of procedural controls had an important influence on this near-final step in the evolution of GDC 62. Thus, the rulemaking

¹⁶ See Memorandum from Edson G. Case, NRC, to Harold L. Price, et al., AEC, re: Revised General Design Criteria (October 12, 1970), and enclosed letter from Edward A. Wiggin, AIF, to Edson G. Case, NRC (October 6, 1970) Attached to the Wiggin letter is a marked-up version of the June 4, 1966, revised draft of the GDC. The Case Memorandum and enclosed documents are attached to Orange County's Summary as Exhibit 15.

¹⁷ Final Rule, General Design Criteria for Nuclear Power Plants, 36 Fed. Reg. 3,255 (February

history of GDC 62 illustrates the importance placed by the Commission on physical systems and processes, in contrast to procedural controls.

C. The Harris Board Misinterpreted the Rulemaking History of GDC 62.

The Licensing Board's interpretation of GDC 62 in LBP-00-12 is based on a distorted and incomplete reading of its regulatory history. The Board attributed great significance to the wording of the proposed GDC prior to its promulgation:

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

51 NRC at 259. In the Board's view, this language from the Proposed Rule shows that the Commission intended to include procedural controls within the scope of "physical systems and processes." *Id.* However, the Board completely overlooked the more significant fact that in the Final Rule, in response to a comment by Oak Ridge National Laboratory, the Commission *completely removed* any reference to "procedural controls."

The Board also failed to examine the Proposed Rule in its entire context: shortly before the Proposed Rule was issued, a previous draft of the criticality prevention GDC (then numbered 61) provided that:

Possibilities for inadvertent criticality must be prevented by physical systems or processes to every extent practicable. Such means as favorable geometries shall be emphasized over procedural controls.¹⁸

Thus, the previous proposed language would have permitted procedural measures, but would have emphasized physical measures over procedural measures. When the phrase "to every extent practicable" was removed from the language of the proposed rule, the

20, 1971). A copy of the Federal Register notice is attached to Orange County's Summary as Exhibit 16.

¹⁸ This language was included in an attachment to a letter from J.J. DiNunno of the AEC to Nunzio J. Palladino of the ACRS, dated February 8, 1967.

Commission neglected to also remove the reference to procedural controls. However, this inconsistency was later corrected in the language of the final rule. The Board erroneously focused on the inclusion of the phrase “procedural controls” in the Proposed Rule, rather than noting the significance of the facts that (a) the phrase originally appeared in a draft that also would have permitted administrative criticality prevention measures, and (b) the phrase was completely removed from the Final Rule.

Equally important, the Board failed to explain how its reading of the regulatory history of GDC 62 can be consistent with the plain language of the standard. If the history of the rulemaking shows that the Commission intended to include *any* criticality prevention measures within the ambit of GDC 62, then why did it use the word “physical” to modify the phrase “systems and processes?” This question remains unanswered by the Board in LBP-00-12.

D. The Harris Board Erred In Finding That 10 C.F.R. § 50.68 Supports Its Ruling.

The Harris Board also found support for its ruling in the NRC’s adoption of 10 C.F.R. § 50.68. 51 NRC at 260. To the contrary, GDC 62’s requirement for use of physical systems or processes to prevent criticality is consistent with 10 C.F.R. § 50.68 and other relevant NRC regulations for criticality prevention that were promulgated afterwards.

Aside from GDC 62, prior to 1998 the NRC’s only criticality-related regulation for operating nuclear power plants consisted of 10 C.F.R. § 70.24, which required criticality monitoring for any licensee authorized to possess significant quantities of special nuclear material (“SNM”). The regulation included a provision authorizing licensees to seek an exemption where good cause was shown. 10 C.F.R. § 70.24(d).

On December 3, 1997, the NRC concurrently published in the Federal Register a proposed rule and a direct final rule, making changes to 10 C.F.R. § 70.24 and adding a new section 50.68.¹⁹ The purpose of the amended regulations was to eliminate the requirement for case-by-case exemptions from § 70.24, and establish a blanket exemption for licensees who agreed to follow a set of criticality accident prevention requirements in the new section 50.68. The new set of rules was based on the NRC's experience that a "large number of exemption requests ha[d] been submitted by power reactor licensees and approved by the NRC based on safety assessments which concluded that the likelihood of criticality was negligible."²⁰ The discussion of safety in criticality control which followed this assertion made it clear that the finding of negligible risk was based in part on the assumption that during fuel storage, physical measures such as design features would be used to prevent criticality:

At a commercial nuclear power plant, the reactor core, the fresh fuel delivery area, the fresh fuel storage area, the spent fuel pool, and the transit areas among these, are areas where amounts of SNM sufficient to cause a criticality exist. In addition, SNM may be found in laboratory and storage locations of these plants, but an inadvertent criticality is not considered credible in these areas due to the amount and configuration of the SNM. The SNM that could be assembled into a critical mass at a commercial nuclear power plant is only in the form of nuclear fuel. Nuclear power plant licensees have procedures and the plants have design features to prevent inadvertent criticality. The inadvertent criticality that 10 CFR 70.24 is intended to address could only occur during fuel-handling operations.

In contrast, at fuel fabrication facilities SNM is found and handled routinely in various configurations in addition to fuel. Although the handling of SNM at these facilities is controlled by procedures, the variety of forms of SNM and the frequency with which it is handled provides greater opportunity for an inadvertent criticality than at a nuclear power reactor.

At power reactor facilities with uranium fuel nominally enriched to no greater than five (5.0) percent by weight, the SNM in the fuel assemblies cannot go

¹⁹ Proposed Rule, Criticality Accident Requirements, 62 Fed. Reg. 63,911; Direct Final Rule With Opportunity to Comment, Criticality Accident Requirements, 62 Fed. Reg. 63,825.

²⁰ 62 Fed. Reg. at 63,825, Col. 3.

critical without both a critical configuration and the presence of a moderator. *Further, the fresh fuel storage array and the spent fuel pool are in most cases designed to prevent inadvertent criticality, even in the presence of an optimal density of unborated moderator.* Inadvertent criticality during fuel handling is precluded by limitations on the number of fuel assemblies permitted out of storage at the same time. *In addition, General Design Criterion (GDC) 62 in Appendix A to 10 CFR Part 50 reinforces the prevention of criticality in fuel storage and handling through physical systems, processes, and safe geometrical configuration.* Moreover, fuel handling at power reactor facilities occurs only under strict procedural control. Therefore, the NRC considers a fuel-handling accidental criticality at a commercial nuclear plant to be extremely unlikely. The NRC believes the criticality monitoring requirements of 10 CFR 70.24 are unnecessary as long as design and administrative controls are maintained.²¹

Thus, in promulgating § 50.68, the Commission affirmed the language of GDC 62 which restricts criticality prevention measures to physical systems and processes.

The language of § 50.68, as it was finally promulgated, contains a list of measures for criticality prevention that can be implemented in lieu of maintaining a criticality monitoring system.²² Although these provisions contain some references to procedures and administrative measures, they do not undermine or contradict the general requirement of GDC 62 for physical criticality prevention measures. For instance, subsection (b)(1) requires that:

Plant procedures shall prohibit the handling and storage at any one time of more fuel assemblies than have been determined to be safely subcritical under the most adverse moderation conditions feasible by unborated water.

This provision simply requires licensees to have a procedure which forbids them from handling or storing any fuel assemblies for which the licensees are unable to maintain subcriticality. It does not explicitly address whether, for the number of assemblies that *are* permitted to be handled or stored, criticality control must be accomplished through physical measures or may be addressed by administrative

21 62 Fed. Reg. at 63,825-26. (emphasis added)

22 See Final Rule, Criticality Accident Requirements, 63 Fed. Reg. 63,127 (November 12,

measures. However, it is noteworthy that the provision assumes that at least one administrative measure, reliance on the presence of boron in the pool water, will not be available.

Subsections (b)(2) and (b)(3) provide that:

(2) The estimated ratio of neutron production to neutron absorption and leakage (k-effective) of the fresh fuel in the fresh fuel storage rack shall be calculated assuming the racks are loaded with fuel of the maximum fuel assembly reactivity²³ and flooded with unborated water and must not exceed 0.95, at a 95 percent probability, 95 percent confidence level. This evaluation need not be performed if administrative controls and/or design features prevent such flooding or if fresh fuel storage racks are not used.

(3) If optimum moderation of fresh fuel in the fresh fuel storage racks occurs when the racks are assumed to be loaded with fuel of the maximum fuel assembly reactivity and filled with low-density hydrogenous fluid, the k-effective corresponding to this optimum moderation must not exceed 0.98, at a 95 percent probability, 95 percent confidence level. This evaluation need not be performed if administrative controls and/or design features prevent such flooding or if fresh fuel storage racks are not used.

These requirements relate to the storage of fresh fuel in fresh fuel storage racks. Fresh fuel storage racks are free-standing racks that surround the fresh fuel with air. By design, no water is present that could act as a moderator. The absence of water as a moderator is a physical system or process for criticality control, built into the design of the fresh fuel storage facility. This is consistent with GDC 62.

Subsections (b)(2) and (b)(3) require the licensee to perform an accident analysis that demonstrates criticality will be prevented, even if water accidentally enters the fresh fuel racks. A licensee may be exempted from the accident analysis if it demonstrates one

1998).

²³ Orange County notes that there has been some dispute regarding the meaning of the phrase "fuel of the maximum fuel assembly reactivity." In the Millstone oral argument, counsel for the licensee and the Staff argued that the phrase refers to the most reactive fuel assembly permitted in a particular rack. Orange County believes that this is not a sensible interpretation of the phrase. It should be interpreted to mean the most reactive fuel that is permitted into the pool or any

of two things: that flooding will be prevented by administrative measures, or that fresh fuel storage racks will not be used. The first option, use of administrative measures to prevent flooding, is *in addition to* the design features by which fresh fuel racks are located in a place that is removed from the presence of water. Thus, it cannot be viewed as a primary criticality prevention measure, but as a secondary measures used as a back-up to the primary design features. If the second option is elected, the licensee must show that fresh fuel racks are not used, *i.e.*, that the fresh fuel is stored in a fuel pool. If fresh fuel is stored in a pool, it must meet the same criticality prevention requirements as apply to spent fuel (*see* subsection (b)(4), discussed below). Under these requirements, the fuel must remain subcritical, even in the absence of soluble boron.²⁴ Accordingly, there is nothing about subsections (b)(2) or (b)(3) that is inconsistent with the requirement of GDC 62 that physical systems and processes must be used to prevent criticality.

Subsection (b)(4) relates to the storage of fuel in spent fuel pools. Although this provision also mentions administrative measures in the sense that it discusses the parameters for taking credit for the presence of soluble boron in the water, the provision also makes it clear that criticality ultimately must be prevented *without* resort to administrative measures:

If no credit for soluble boron is taken, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. If credit is taken for soluble boron, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded

connecting pool. Otherwise, the well-established concepts of conservatism and defense-in-depth are undermined.

²⁴ As discussed in note 28 below, arrangements for storage of fresh fuel in a pool should also ensure that the fuel remains subcritical in the presence of boiling water, foam or mist.

with unborated water.

Thus, the basic requirement of subsection (b)(4) is that criticality must be controlled (*i.e.*, Keffective maintained below 1.0) without considering the presence of soluble boron in the water.²⁵

It should also be noted that the type of ongoing administrative measure proposed by CP&L in the instant case, *i.e.*, control of burnup/enrichment levels in the fuel, is not condoned by § 50.68, or even mentioned.²⁶

E. NRC Staff Guidance Documents Contradicting GDC 62 Have No Binding Effect.

In LBP-00-12, the Licensing Board also found support for its holding in NRC Staff regulatory guidance, including Draft Reg. Guide 1.13. 51 NRC at 260. The Commission has stated generally that “if there is conformance with regulatory guides, there is likely to be compliance with the GDC.” *Petition for Emergency and Remedial Action*, CLI-78-6, 7 NRC 400, 406 (1978). As the Board has recognized, however, this is “not a blanket endorsement of the notion that regulatory guides necessarily govern.” LBP-99-25, 50 NRC at 35. Where there is inconsistency between a regulation and a regulatory guide, the regulation is controlling. A regulation has the force of law; in comparison, a regulatory guide is a set of recommendations setting forth acceptable

²⁵ The other provisions of § 50.68, subsections (b)(5) through (8), are not relevant to this proceeding.

²⁶ In its Summary, at pages 33-38, Orange County also explained why other NRC criticality prevention regulations at 10 C.F.R. § 72.124 do not shed any light on the Commission’s intentions with respect to the interpretation of GDC 62. Although these regulations do not unequivocally require the use of physical systems or processes for criticality control, and instead apply a practicability standard, they are not applicable to nuclear reactors. Instead, they apply to Independent Spent Fuel Storage Installations (“ISFSI’s”), which are different in design and purpose. Moreover, the portion of § 72.124 which arguably relaxes criticality prevention requirements was promulgated without notice or opportunity to comment, and therefore may not be relied on for any precedential value. Notably, neither LBP-00-12 nor LBP-00-26 places any reliance on this regulation.

methods for complying with the regulation. Such documents “are useful as guides,” but “insofar as the adjudicatory process is concerned, they represent the opinions of one of the parties to that process and as such cannot be viewed as necessarily controlling.”²⁷ Therefore, a Reg. Guide cannot be relied on to modify or circumvent the requirements of duly promulgated regulations like the General Design Criteria. Orange County submits that the Millstone Board was correct in ruling that the NRC Staff’s regulatory guidance on criticality prevention has no binding effect in this proceeding. LBP-00-26, slip op. at 44. As the Board observed, “the Staff could have been mistakenly interpreting the provision since its promulgation.” *Id.*

Finally, in LBP-00-12, the Board relied on two adjudicatory decisions cited by the NRC Staff: *Consumers Power Co.* (Big Rock Point Nuclear Plant), ALAB-725, 17 NRC 562, 564-64 571 (1983); and *Florida Power & Light Co.* (St. Lucie Nuclear Power Plant, Unit 1), LBP-89-12, 29 NRC 441, 454-56, *aff’d on other grounds*, ALAB-921, 30 NRC 177 (1989). 51 NRC at 260. *Florida Power & Light* is completely inapposite, however, because it does not address GDC 62 at all, but rather interprets very different language in the Standard Review Plan.

In *Consumers Power*, the Appeal Board found that a remotely controlled makeup line for the spent fuel pool constituted a “physical system” for criticality control, and therefore was consistent with the requirement of GDC 62 that criticality must be maintained through “physical systems or processes.” *Id.* at 571. The use of a makeup line is an impermissible administrative procedure, because it requires ongoing reliance on human action to turn on the flow of water into the makeup line. Thus, to the extent that it

²⁷ *Potomac Electric Power Co.* (Douglas Point Nuclear Generating Station, Units 1 and 2), LBP-76-13, 3 NRC 425, 432 (1976). *See also Louisiana Energy Services* (Claiborne Enrichment

approved an ongoing administrative measure for criticality prevention, the *Consumers Power Decision* was in error. It should be noted, however, that *Consumers Power* involved very different circumstances than are present in either the Millstone or the Harris case, and therefore its applicability to these circumstances is questionable.²⁸

F. The Harris Board Erred By Ignoring the Relevance of the Erosion of GDC 62 in its Application by the NRC Staff.

Finally, in LBP-00-12, the Board completely ignored the history of the evolution of criticality prevention measures that is set forth in Orange County's Summary at 9-13. This history shows that at the time GDC 62 was promulgated, procedural measures for criticality prevention were not in use as a general matter. Over time, as the inventory of spent fuel at nuclear power plant sites increased, the NRC Staff began to relax its requirements for criticality prevention measures. Instead of referring to GDC 62, the Staff developed other guidance documents that departed from the strict standards of GDC 62 by permitting reliance on administrative measures. Rather than address the regulatory and safety problems posed by the increasingly high density of spent fuel pool storage at

Center), LBP-91-41, 34 NRC 332, 354 (1991).

28 First, the Appeal Board noted that it had been provided with "no evidence" to suggest that the make-up line was not a physical system within the "broad, general terms" of the GDC. 17 NRC at 571. Here, in contrast, Orange County has provided the Board with evidence of (a) the clear basis for distinguishing physical measures from ongoing administrative measures, and (b) the Commission's intent to preclude the use of procedural controls for criticality control. Second, the circumstance addressed in the *Consumers Power* decision, involving the hypothetical exposure of high-reactivity (fresh or nearly-fresh) fuel to boiling water, foam or mist, is now implicitly addressed in Staff guidance which establishes a $K_{\text{effective}}$ value of 0.98 for such a scenario, rather than requiring measures for maintaining $K_{\text{effective}}$ below 0.95. The Staff guidance is provided in the context of fresh fuel storage in a new fuel storage facility (vault), but logically must apply to pool storage of high-reactivity fuel that could become critical in the presence of boiling water, foam or mist. Indeed, the informational Appendix A to ANSI/ANS-8-17-1984, American National Standard, Criticality Safety Criteria for the Handling, Storage and Transportation of LWR Fuel Outside Reactors (January 13, 1984), indicates that "void formation by boiling" is a normal condition for the purpose of evaluating the potential for criticality in a fuel pool. Thus, the question of whether a makeup line constitutes a physical measure for purposes of eliminating a boiling, misting or foam environment in a spent fuel pool has effectively been mooted.

U.S. nuclear power plants, the Staff has progressively relaxed its application of GDC 62 until the standard has become meaningless. The history of the Staff's application does not show the development of well-reasoned and consistent guidance for the application of GDC 62, but a pattern of relaxing the standard under intense pressure from nuclear licensees that are clamoring for additional spent fuel storage space.

IV. CONCLUSION

Under the NRC Staff's interpretation of GDC 62, as now approved by the Licensing Board in LBP-00-12 and LBP-00-26, GDC 62 stands for nothing more than the general prescription that "criticality must be prevented by any means available." Under these rulings, GDC 62 can provide no brake on the increasing industry trend to pack spent fuel as tightly as possible in pools, with a corresponding increase in reliance on human intervention to prevent criticality, and a corresponding decrease in reliability.²⁹

In LBP-00-26, the Millstone Board correctly recognized the superiority, from a safety standpoint, of engineered features for the prevention of criticality. *Id.*, slip op. at 44. The Board's mistake was in concluding that GDC 62 expresses a mere "preference" for such measures, and not a requirement. The Board's reading of GDC 62 was incorrect. In promulgating that standard, the Commission intended to preclude the very type of reliance on procedural measures that is in widespread practice today. The Commission must enforce the letter and spirit of GDC 62, and reverse LBP-00-26.

²⁹ As noted in a recent Oak Ridge National Laboratory study, the latest criticality prevention strategy taken up by licensees – allowing increased reliance on credit for soluble boron under normal conditions – poses the potential for significant nonconservatism in criticality calculations. See NUREG/CR-6683, *A Critical Review of the Practice of Equating the Reactivity of Spent Fuel to Fresh Fuel in Burnup Credit Criticality Safety Analyses for PWR Spent Fuel Pool Storage* (September 2000). Orange County notes that this study was published in the fall of 2000, after

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February 7, 2001

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

_____)	
In the Matter of)	
)	
NORTHEAST NUCLEAR ENERGY)	Docket No. 50-423 – LA-3
COMPANY)	ASLBP No. 00-771-01-LA
Millstone Nuclear Power Station, Unit No. 3)	
_____)	

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

CERTIFICATE OF SERVICE

I certify that on February 7, 2001, copies of the foregoing ORANGE COUNTY'S AMICUS BRIEF ON REVIEW OF LBP-00-26 were served on the following by e-mail, as denoted by asterisk. Service was only partially successful because of incorrect e-mail addresses. On February 8, 2001, copies were re-sent by e-mail and also sent to the entire service list by first class mail.

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