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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSIONERS

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

In the Matter of:

) Docket No. 72-22-ISFSI

PRIVATE FUEL STORAGE, LLC
(Independent Spent Fuel
Storage Installation)

) ASLBP No. 97-732-02-ISFSI

) April 10, 2003

STATE OF UTAH'S ANSWER IN OPPOSITION TO THE APPLICANT'S AND
THE STAFF'S PETITIONS FOR COMMISSION REVIEW OF LBP-03-04

Pursuant to 10 CFR § 2.786(b)(3), the State of Utah files this Answer opposing the petitions for review filed March 31, 2003 by Applicant Private Fuel Storage, L.L.C. ("PFS") and by the NRC Staff. Because the bases for review asserted by PFS and the Staff are similar, the State's Answer is intended to address both petitions unless otherwise indicated.

I. BACKGROUND

The sole issue before the Licensing Board was whether the probability of an aircraft crash at the proposed PFS storage facility exceeds the ISFSI screening threshold. The site chosen for the 4,000 metric ton ISFSI lies under a narrow military airspace used as the entrance to the nation's largest test and bombing range. Over 7,000 fighter jets are funneled through this airway annually. Because of the excessively high calculated crash probability for this location, PFS relies on a subjective opinion to discount the crash rate: pilots in crashing aircraft will prevent their disabled F-16s from crashing at the PFS site. This "pilot avoidance" theory, for which no data exist and no study has been undertaken by any authority, is nowhere mentioned in the extensive NRC and DOE aircraft crash

methodology.

The Board heard evidence on this single contention for 12 days, hearing from 11 witnesses and receiving 226 exhibits, resulting in a transcript of over 3,200 pages. The Board issued a 220 page decision reviewing the evidence presented, including reasons for its conclusion that “[w]e are persuaded that the State has shown by a wide margin – with evidence that is far more deeper-rooted than a few examples of failures – that the Applicant’s expert testimony advocating [a success rate for pilot avoidance] of 95% is not adequately supported.” LBP-03-04, slip op. at 44.

II. STANDARD FOR REVIEW

PFS filed a motion for reconsideration with the Board contemporaneously with its Petition. In this situation, the Commission will delay considering the petition for review until after the Board has ruled. Private Fuel Storage, L.L.C. (Independent Spent Fuel Storage Installation), CLI-01-1, 53 NRC 1, 3 (2001).

The Commission may in its discretion grant review as provided in 10 C. F. R. § 2.786(b). The grounds asserted by PFS and the Staff are general dissatisfaction with the Board’s factual determination that the crash probability at the PFS site exceeds the ISFSI threshold. On fact-specific matters, particularly where evidence from experts must be weighed, the Commission is disinclined to upset findings and conclusions based on an extensive record. Hydro Resources, Inc. (P.O. Box 15910, Rio Rancho, NM 87174), CLI-01-4, 53 NRC 31, 45-46 (2001); Carolina Power and Light Co. (Shearon Harris Nuclear Power Plant), CLI-01-11, 53 NRC 370, 388 (2001).

An appeal may only be based on matters and arguments raised below. Houston

Lighting & Power Co. (Allens Creek Nuclear Generating Station, Unit 1), ALAB-582, 11 NRC 239, 242 (1980).

III. BASES FOR REVIEW ASSERTED BY APPLICANT AND STAFF

A. The Commission's 1×10^{-6} ISFSI Probability Threshold

PFS and the Staff assert that the Board erred when it found that the aircraft crash probability of 4.29×10^{-6} exceeded the 1×10^{-6} threshold probability for an ISFSI.¹ In support of this position, PFS notes that NRC's reactor guidance document NUREG-0800² provides that a 1×10^{-6} estimate may be deemed acceptable even though the reactor threshold is "approximately" 1×10^{-7} ; from this PFS argues by "analogy" that a 1×10^{-5} probability should be acceptable under the 1×10^{-6} ISFSI threshold, thereby rendering the 4.29×10^{-6} probability for the PFS site acceptable. PFS Petition at 4-5. The Staff takes a similar position. Staff Petition at 4-8. These arguments fail in several respects and do not show that the Board committed an error of law in its determination.

PFS notes that NUREG-0800 gives the aircraft crash probability threshold for reactors as "approximately" 1×10^{-7} . *Id.* at 4. Like all guidance documents, NUREG-0800 is

¹ As a preliminary matter, the State notes that the PFS Petition incorrectly states that the Board held that the 1×10^{-6} standard is to be applied as "rigid" as opposed to being "flexible." PFS Petition at 4. In fact, the Board held only that it would not create an order of magnitude confidence interval surrounding the standard, and further held that it would not "stretch" the 1×10^{-6} criterion to allow the Applicant to move forward without addressing the issue of consequences. The Board found the calculated probability of a crash to be over four times the threshold standard for an ISFSI. The Board used the words "rigid" and "inflexible" only to describe assertions of the Staff. LBP-03-04, slip. op. at 76-79.

² Nuclear Regulatory Commission, NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants* (June 1987).

not a legally binding regulation. PFS, CLI-01-22, 54 NRC 255, 264 (2001). In contrast, as part of the PFS adjudicatory proceeding, the Commission determined as a matter of law that the ISFSI threshold standard, without using “approximately” or other qualifier, “should be set at one in a million (1×10^{-6}).” Id. at 263-265. There is simply no legal basis for PFS’s claim that the reactor guidance document requires the Board to read the word “approximately” into the ISFSI threshold set by the Commission.

PFS also asserts that the Board erred in not following the staff guidance document which allows the reactor standard to be exceeded, under certain conditions:

... data are often not available to permit accurate calculation of probabilities. Accordingly, the expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines of approximately 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower.

NUREG-0800 at 2.2.3-2 (*emphasis supplied*). The maximum amount the 1×10^{-7} reactor standard can be exceeded under the guidance is 9×10^{-7} ($1 \times 10^{-6} - 1 \times 10^{-7} = 9 \times 10^{-7}$). NUREG-0800 was written for use with the reactor threshold of one in ten million (1×10^{-7}), ten times higher than the ISFSI threshold of one in a million. Even if the ISFSI standard could be exceeded by this same amount, the threshold would be lowered to 1.9×10^{-6} ($1 \times 10^{-6} + 9 \times 10^{-7} = 1.9 \times 10^{-6}$). The PFS probability of 4.29×10^{-6} would still clearly exceed the ISFSI threshold even if it could be reduced in this manner. Nothing in the NUREG guidance for reactors suggests the lower ISFSI standard is subject to being exceeded ten fold, or as described by PFS and the Staff, an “order of magnitude,” a phrase not even found in the NUREG guidance. NUREG-0800, not written for the lower ISFSI standard, is not entitled to any persuasive weight. PFS, CLI-01-22, 54 NRC at 264. Even if it were applicable, the maximum tolerance of 9×10^{-7} allowed under the NUREG reactor guidance

would not bring the PFS calculated probability within the ISFSI standard.

Furthermore, in determining the ISFSI standard, the Commission referred to the NUREG-0800 text quoted *supra*, which provides that the 1×10^{-7} reactor standard can be exceeded in certain circumstances. CLI-01-22, 54 NRC at 260. The Commission rejected the NUREG reactor standard in favor of the 1×10^{-6} geologic repository operations area ("GROA") threshold standard, found at 61 Fed. Reg. 64,257 (1996), which contains no similar provision suggesting that the standard can be exceeded. CLI-01-22, 54 NRC at 261.

Most importantly, even if the NUREG-0800 reactor guidance were in all respects applicable here, the Board's ruling is consistent with that guidance. A calculated probability exceeding the NUREG reactor standard of 1×10^{-7} would only be acceptable under certain circumstances; these are:

1. when data are unavailable to permit accurate calculation; and
2. when the realistic probability is shown to be lower by qualitative arguments.

NUREG-0800 at 2.2.3-2. Case law in reactor license proceedings clearly affirms this premise, *i.e.*, subjective arguments will only be allowed to show a lower realistic probability when data are so inaccurate that subjective arguments become more persuasive. To illustrate, where the number of flights used in calculation was simply estimated at 1,500 without supporting data, but actual data showed only 99 flights for a recent year, subjective arguments were allowed to show the realistic probability was lower than the calculated probability. Consumer's Power Co. (Big Rock Point Plant), LBP-84-32, 20 NRC 601, 648-653 (1984), *aff'd* ALAB-795, 21 NRC 1 (1985). Conversely, where neither inaccurate data nor subjective arguments were considered, the Appeals Board found that a calculated probability of 2.3×10^{-7} "clearly exceeds" the reactor threshold of "approximately 1×10^{-7} ."

Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 2), ALAB-486, 8 NRC 9, 41-42, *rev denied*, CLI-78-19, 8 NRC 295 (1978).

The Board's determination is based on specific historical data from the U.S. Air Force to calculate the probability – no mere assumptions were used for input values. PFS has not claimed accurate data were unavailable and indeed the Board found that the accuracy of the data was “not troublesome.” LBP-03-04, slip op. at 76. The arguments advanced by PFS simply did not justify finding a lower probability than the actual calculated probability, which the Board found was over four times the ISFSI threshold.³ Even under the NUREG reactor guidance, the threshold limit cannot be exceeded as a matter of course, as suggested by PFS; such a reading would render the threshold of 1×10^{-7} meaningless. Rather, a factual inquiry on a case by case basis must determine whether accurate data were available for calculation of probability and whether subjective arguments are sufficiently persuasive to overcome whatever weakness exists in the data. In the instant matter, the Board's decision neither found data lacking to permit an accurate calculation, nor did it find the arguments of PFS persuasive enough to supplant the actual data used. There simply was no showing that the realistic probability was lower than the calculated probability. PFS has failed to show that the Board committed any error.

B. The Board's Evaluation of Evidence

PFS and the Staff complain generally that the Board found the evidence was insufficient to allow the calculated crash probability to be reduced based on the novel theory of “pilot avoidance.” The Board devoted 58 pages to examining the evidence on this issue

³ The Board found that the crash probability is 4.29×10^{-6} (one in 233,100). LBP-03-04, slip op. at 60.

alone, and concluded:

... the preponderance of the evidence did not support, and indeed substantially undercut, the Applicant's assertion that pilots would, before ejecting, almost invariably (95% of the time) act affirmatively to guide their aircraft away from striking the PFS facility in the event of an impending crash.

LBP-03-04, slip op. at 117. To put this issue in perspective, the task that PFS claimed a pilot would be able to perform with near certainty – greatly simplified for illustration – is the following:

A pilot of an F-16 knowing his aircraft will crash within seconds, will, before the pilot ejects to save his life, divert his attention from emergency procedures to protecting the PFS storage casks, and will then locate from a distance of over 3 miles and regardless of the weather conditions, the PFS casks and other ground sites where the F-16 could impact, and will then maneuver the aircraft so that after the pilot ejects it will descend so as not to crash into any ground sites, including the casks.⁴

The evidence on whether a pilot could and would perform this task to a near certainty is extensive, but the following undisputed facts are exemplary:

1. No study has ever been made of a pilot's ability to guide a crashing aircraft away from a ground site. Tr. (Campe) at 4109; Horstman Post Tr. 4214 at 25.
2. No NRC or DOE document makes reference to a pilot's ability to avoid a ground site, nor have any authorities recognized such an ability. Tr. (Campe) at 4109; Horstman Post Tr. 4214 at 25.
3. Pilots receive no training in attempting to avoid a specific ground site in an emergency ejection situation and pilots do not have the tools for such a task. Tr. (Horstman) at 8550-51; 13464-65. Pilots do not practice ejections and do not eject from an aircraft until faced with an actual emergency. Tr. (Cole, Fly) at 3332-37.
4. An advisory published by the Air Force Chief of Safety advises of 1) significant pilot errors in emergency situations; 2) 73% of ejections occurring below the published minimum altitude due to futile attempts to restart engines; 3) erroneous assumptions and poor airmanship flourished in emergency situations. State Exh. 57.

⁴ See *State of Utah's Reply to the Proposed Findings of Fact and Conclusions of Law of the Applicant and the NRC Staff on Contention Utah K/Confederated Tribes B* (October 7, 2002) at 3.

5. The PFS evidence that pilots would, 95% of the time, successfully direct a crashing F-16 away from the PFS site came solely from the joint opinion of three retired Air Force officers hired as witnesses by PFS, none of whom have themselves ejected, and only one of whom had piloted an F-16. LBP-03-04, slip. op. at 99-102. These three witnesses rendered the opinion as a totally subjective estimate without performing any calculations or statistics. Tr. (Jefferson) 3215-16; 3966-67; 3972-73; 8882; 13118-13122.

6. After opining a 95% success rate for pilots, in an effort to justify the opinion, the PFS experts reviewed 126 accident reports and concluded that the reports did not statistically support their 95% success rate opinion. Tr. (Jefferson) 3967; 13100-1; 13118-22.

The PFS Petition for review, presumably its best effort to show error by the Board, asserts that its 95% success rate opinion is supported because the accident reports “show no instance where a pilot failed to avoid a site on the ground when he had the ability to do so.” PFS Petition at 7. In fact, none of the accident reports even show circumstances where the task at issue here was encountered, *i.e.*, where a pilot identified a specific ground site prior to reaching the minimum ejection altitude and directed the crashing F-16 away before ejecting. State Exhibit 223; Tr. (Horstman) at 13370-92; 13407-10; 13445-47. Thus, the best supporting evidence PFS has advanced is that the reports offer no example of a pilot attempting, and therefore neither failing nor accomplishing, the avoidance task at issue.

PFS and the Staff have suggested that since the Board found the 95% success rate not supported by the evidence, the Board should have found some other success rate for pilot avoidance. However, there is no evidence in the record supporting any other success rate. The 95% success rate claimed by PFS was an entirely subjective opinion:

Q: [by Mr. Soper] . . . Did you do any calculations to come up with 95%?

Gen. Jefferson: No. We did the calculations to see how much time we would have.

Q. I see. So you might have picked 100%?

Gen. Jefferson: Could have.

Q. Or 80 %?

Gen. Jefferson: Not likely.

Q. But it wouldn't be driven by numbers, it would be, in your opinion, which is the most appropriate to use?

Gen. Jefferson: Yes, knowing what a pilot does and how much time he has to react.

Q. I see. And again, you have never ejected yourself, have you, sir?

Gen. Jefferson: No, but I've been in emergencies.

Tr. (Jefferson) 3215-16. A licensing board may only perform independent calculations using evidence in the record and "universally accepted engineering principles and known facts."⁵

In the instant case, there are no data in evidence from which the Board could perform an independent calculation of pilot success.

PFS also asserts the Board improperly considered its evidence that the width of the airway is 10 miles. State Exhibit 156B, a cross section of the airway taken from the PFS Crash Report⁶, plainly shows that a 10 mile width does not exist. So obvious is this conclusion that Judge Lam stated, "Do you have the space or do you not have that space? I think this chart [State Exhibit 156B] is self-evident." Tr. (Lam, J.) at 3451. In fact, presented with the exhibit, PFS witness Jefferson admitted that ten miles of width does not exist in the airway, and when asked by Judge Farrar to justify his use of ten miles, could not. Tr. (Jefferson; Farrar, J.) at 3451- 3453.

Each the evidentiary issues raised in the Petitions filed by PFS and the Staff are extensively discussed by the Board, and its findings "are supported by a preponderance of the reliable, material and probative evidence in the record." LBP-03-04, slip op. at 218. There is no showing of a factual decision that is "clearly erroneous" to support Commission

⁵Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-229, 8 AEC 425, 437 (1974), *rev on other grounds*, CLI-74-40, 8 AEC 809 (1974).

⁶ Applicant Exhibit N.

review.

C. The Board's Exclusion of Evidence Regarding Consequences

PFS (but not the Staff) claims the Board improperly excluded PFS evidence pertaining to the consequences of an F-16 crash, specifically, evidence addressing cask penetration and release of radiation. PFS fails to point out that consequence evidence was excluded by the Board's order granting PFS's own motion to strike such evidence. In support of its motion to strike that evidence, PFS argued to the Board:

The portions of [the State's testimony] related to the potential consequences of aircraft crashes are not probative and are irrelevant to determining the probability of such a crash occurring.^[7]

* * *

The issue for this hearing is whether the probability of an aircraft crash or jettisoned ordnance is sufficiently low that it need not be considered in the design of the PFSF. . . . Therefore, [the State's] radiation dose consequences testimony and the cited exhibits related to it should be stricken as irrelevant.^[8]

Similarly, the Staff filed a motion in limine arguing that consequences evidence pertaining to "penetration of casks and canisters" offered by the State and the Applicant should be stricken because it was "irrelevant to the probability calculation."⁹ The Board, after consultation with Judge Bollwerk, who was present at the hearing, granted the motions

⁷ *Applicant's Motion To Strike Portions of State Of Utah's Prefiled Testimony of Dr. Marin Resnikoff Regarding Utah Contention K/Confederated Tribes Contention B* (March 25, 2002) at 2.

⁸ *Id.* at 5-6.

⁹ *NRC Staff's Motion In Limine to Exclude Portions of the State of Utah's Prefiled Testimony and Exhibits Concerning Contention Utah K/Confederated Tribes B* (March 25, 2002) at 5 and n. 4.

of the Applicant and Staff:

... we are going to grant motions to the extent that they want to exclude the testimony dealing with consequences. The consequences, that's for a later issue at a later time.

Tr. (Farrar, J.) at 3008. To preserve a claim of error on an ruling, a party must interpose its objection and basis clearly and affirmatively. Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B & 2B), ALAB-463, 7 NRC 341, 362 n. 90, *recons. denied* ALAB-467, 7 NRC 459 (1978). PFS made no objection to the exclusion of such evidence, but to the contrary, urged its exclusion as irrelevant. PFS has not only failed to preserve a claim of error but has waived review of the issue by conceding, in fact advancing, the proposition that evidence of crash consequences is irrelevant to the issue before the Board.

Furthermore, the fact that crash consequences are irrelevant and properly excluded is without question. It is undisputed that crash probability is determined by the formula set forth in NUREG 0800¹⁰, which does not rely in any way on input values relating to cask penetration or radiation release. The calculated impact probability is neither raised nor lowered, nor in any way more correctly calculated, depending on the strength or weakness of the casks, the radiological properties of contents which may be released, nor any consequence that may be brought about by an F-16 or ordnance impact to the cask. The consequences of a crash are simply irrelevant to the issue before the Board of whether PFS met the 1×10^{-6} screening level such that a consequence analysis would not be required.

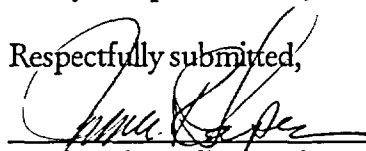
¹⁰ $P = N \times C \times A/w$, where P = probability of a crash, N = number of annual flights, C = crash rate per mile, A = area of facility, and w = width of airway. Applicant's Crash Report (Applicant Exhibit N), at 6; NUREG-0800 at § 3.5.1.6-3.

IV. CONCLUSION

The Board's determination was based on a 12 day hearing with substantial expert witness testimony and 226 exhibits. The Board discussed this evidence in a 220 page decision. The petitions have shown no reasons why the Commission should upset the findings and conclusions based on this extensive record. Neither PFS nor the Staff has demonstrated a basis for review under 10 CFR 2.786(b), and accordingly, the petitions should be denied.

DATED this 10th day of April, 2003.

Respectfully submitted,



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CERTIFICATE OF SERVICE

I hereby certify that a copy of STATE OF UTAH'S ANSWER IN OPPOSITION TO THE APPLICANT'S AND THE STAFF'S PETITIONS FOR COMMISSION REVIEW OF LBP-03-04 was served on the persons listed below by electronic mail (unless otherwise noted) with conforming copies by United States mail first class, this 10th day of April, 2003:

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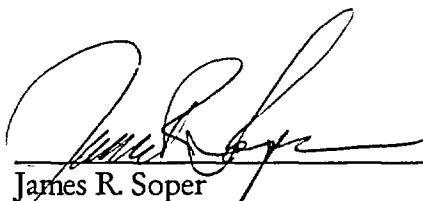
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