

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE, L.L.C.	)	Docket No. 72-22-ISFSI
	)	
(Independent Spent	)	
Fuel Storage Installation)	)	

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NRC STAFF'S BRIEF ON THE APPROPRIATE  
REGULATORY STANDARD TO BE USED IN EVALUATING  
AIRCRAFT CRASH HAZARDS AT AN INDEPENDENT SPENT  
FUEL STORAGE INSTALLATION UNDER 10 C.F.R. PART 72

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Sherwin E. Turk  
Counsel for NRC Staff

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INTRODUCTION

Pursuant to the Commission's Order in CLI-01-15,<sup>1</sup> the NRC Staff ("Staff") hereby files its Brief concerning the appropriate regulatory standard to be used in evaluating aircraft crash hazards at an independent spent fuel storage installation ("ISFSI") under 10 C.F.R. Part 72. For the reasons set forth below, the Staff submits that the appropriate standard to be used is a probability of occurrence of approximately  $10^{-6}$  (about one in a million) per year. Accordingly, the Staff submits that the Licensing Board's ruling in LBP-01-19,<sup>2</sup> in which it adopted a  $10^{-6}$  standard, should be affirmed.

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<sup>1</sup> *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-01-15, 53 NRC \_\_ (June 27, 2001) (slip opinion).

<sup>2</sup> *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-19, 53 NRC \_\_ (May 31, 2001) (slip opinion) ("Memorandum and Order (Granting in Part and Denying in Part Summary Disposition Motion Regarding Contention Utah K/Confederated Tribes B; Referring Ruling on Aircraft Crash Hazard Regulatory Standard to the Commission)"). The Licensing Board referred its ruling to the Commission, as to the appropriate standard to be used in assessing aircraft crash hazards, "given the significant policy and resource implications of this particular ruling." *Id.*, slip op. at 21.

### BACKGROUND

This proceeding concerns the application of Private Fuel Storage, L.L.C. ("PFS" or "Applicant"), for a license to construct and operate an ISFSI on the Reservation of the Skull Valley Band of Goshute Indians. Numerous contentions were filed by the State of Utah ("State") and other petitioners to intervene, including, in relevant part, Utah Contention K ("Inadequate Consideration of Credible Accidents") and Confederated Tribes Contention B ("Lack of Protection Against Worst Case Accidents"). The Licensing Board admitted and consolidated these two contentions in its initial ruling on contentions. See *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-98-7, 47 NRC 142, 190-91, 234-35 (1998). The Board limited the contention to certain specified issues including, *inter alia*, the impact on the ISFSI of accidents involving materials or activities emanating from: the Tekoi Rocket Engine Test Facility, Dugway Proving Ground, Salt Lake City International Airport, Hill Air Force Base ("AFB"), and the Utah Test and Training Range ("UTTR"). As admitted by the Licensing Board, the consolidated contention states as follows:

The Applicant has inadequately considered credible accidents caused by external events and facilities affecting the ISFSI and the intermodal transfer site, including the cumulative effects of the nearby hazardous waste and military testing facilities in the vicinity and the effects on wildfires.

*Id.* at 253 (emphasis added).

On June 7, 1999, the Applicant filed a motion for partial summary disposition of this contention.<sup>3</sup> On August 30, 1999, the Licensing Board granted the Applicant's motion with respect to certain specified issues, and denied the motion or deferred ruling on other issues. *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-99-35, 50 NRC 180, 200-01

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<sup>3</sup> See (1) "Applicant's Motion For Partial Summary Disposition of Utah Contention K and Confederated Tribes Contention B," dated June 7, 1999; (2) "NRC Staff's Response to Applicant's Motion For Partial Summary Disposition of Utah Contention K and Confederated Tribes Contention B," dated July 22, 1999; and (3) "State of Utah's Opposition to Applicant's Motion For Partial Summary Disposition of Utah Contention K and Confederated Tribes Contention B," dated July 22, 1999.

(1999). On September 20, 1999, the Board dismissed another issue raised in this contention, and clarified a portion of its decision in LBP-99-35. *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-99-39, 50 NRC 232 (1999).

On September 29, 2000, the Staff issued its “Safety Evaluation Report Concerning the Private Fuel Storage Facility” (“SER”). Therein, the Staff concluded with respect to aircraft crash hazards that there is reasonable assurance that civilian or military air crashes would not pose a hazard to the facility. SER at 15-81. Further, as pertinent here, the Staff concluded that “the threshold probability of  $1 \times 10^{-6}$  crashes per year is an acceptable value for evaluating aircraft crash hazards at the PFS Facility.” *Id.* at 15-77.

On December 30, 2000, the Applicant filed a further motion for summary disposition of the remaining portions of this contention -- in which it included, *inter alia*, new information concerning sortie and aircraft data from Hill AFB on the number of F-16s transiting Skull Valley en route to the south part of the UTTR for Fiscal Years 1999 and 2000, new information concerning cruise missiles, and a revised assessment of the impact hazard posed by general aviation aircraft.<sup>4</sup>

In LBP-01-19, the Licensing Board issued its decision on the Applicant’s further motion for summary disposition of Contention Utah K/Confederated Tribes B. Therein, the Licensing Board ruled that (a) a genuine dispute of material fact no longer existed with respect to certain issues raised in this contention, (b) a genuine dispute of material fact remained with respect to other specified portions of the contention, and (c) the threshold probability standard to be applied in determining whether aircraft crashes pose a credible hazard for an ISFSI is  $1\text{E-}06$  (*i.e.*,  $10^{-6}$ ) per year. LBP-01-19, slip op. at 18-21. The Licensing Board then referred its ruling on the applicable threshold probability standard to the Commission for review. *Id.* at 21, 54.

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<sup>4</sup> “Applicant’s Motion for Summary Disposition of Utah Contention K and Confederated Tribes Contention B,” dated December 30, 2000 (“Applicant’s Motion”), at 13 and 22.



On June 27, 2001, the Commission issued its Order in CLI-01-15, directing the filing of briefs on the appropriate regulatory standard for determining whether aircraft crash hazards should be deemed to be a “credible accident” for an ISFSI.<sup>5</sup> The Commission observed that NRC regulations require that a proposed site be evaluated “to determine credible accident scenarios associated with external and internal hazards, both natural and man-made, and the facility be designed to withstand credible accidents. See 10 C.F.R. Part 72 Subparts E and F.” CLI-01-15, slip op. at 1. The Commission then summarized the issue in this proceeding as follows:

In its Aircraft Crash Impact Hazard Report (Rev. 4) (Aug. 11, 2000), [PFS] argued that any accident with less than a one in a million ( $10^{-6}$ ) per year probability of occurring – “Benchmark probability”-- was not a credible accident. In its September 29, 2000, final Safety Evaluation Report, the NRC staff, accepting PFS’s reasoning, agreed that the appropriate benchmark was one in a million per year. See SER at 15-77. The State of Utah contends, however, that the benchmark probability for air crash hazards should be one in ten million ( $10^{-7}$ ), a higher standard. The Board found that the benchmark should be set at  $10^{-6}$ , but referred the standard for the Commission’s review. See LBP-01-19 at 19-20. We accept the referral and direct interested parties to submit briefs . . . .

*Id.* at 2.

For the reasons set forth below, the Staff submits that the Licensing Board correctly determined that aircraft crash hazards with less than a one in a million ( $10^{-6}$ ) per year probability of occurring – i.e., the “benchmark probability”-- do not constitute a credible event, and that the credibility of air crash hazards should be judged under a probability standard of approximately  $10^{-6}$  ( $1E-06$ ) per year. LBP-01-19, slip op. at 18-21.

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<sup>5</sup> The State had requested an opportunity to file a brief before the Commission concerning the referred ruling. See (1) “State of Utah’s Request for an Opportunity to Brief the Licensing Board’s Certified Question to the Commission in LBP-01-19”, dated June 7, 2001; (2) “Applicant’s Response to State Request to Brief the Certified Question in Licensing Board Order LBP-01-19,” dated June 8, 2001; and (3) “NRC Staff’s Response to ‘State of Utah’s Request for an Opportunity to Brief the Licensing Board’s Certified Question to the Commission in LBP-01-19,’” dated June 18, 2001.

## ARGUMENT

### I. Regulatory Requirements Applicable to the Assessment of Offsite Hazards at an ISFSI.

In accordance with 10 C.F.R. § 72.90(a), ISFSI applicants are required to investigate the characteristics of any proposed ISFSI site that may directly affect the safety or environmental impact of the proposed ISFSI. In addition, proposed sites “must be examined with respect to the frequency and the severity of external natural and man-induced events that could affect the safe operation of the ISFSI”; and “design basis external events must be determined for each combination of proposed site and proposed ISFSI . . . design.” 10 C.F.R. §§ 72.90(b)-(c). See LBP-01-19, slip op. at 17.<sup>6</sup> Further, pursuant to 10 C.F.R. § 72.94, the region of a proposed ISFSI must be examined for man-made facilities and activities that might endanger the proposed ISFSI, and any important potential man-induced events that affect the ISFSI must be identified; in addition, information concerning “the potential occurrence and severity” of such events must be gathered and evaluated, and “appropriate methods must be adopted for evaluating the design basis external man-induced events, based on the current state of knowledge about such events.” 10 C.F.R. §§ 72.94(b)-(c).<sup>7</sup>

The Commission has established general design criteria (“GDC”) for an ISFSI, as set forth in 10 C.F.R. Part 72, Subpart F. In particular, 10 C.F.R. § 72.122(b)(1) requires protection against environmental conditions and natural phenomena, including the requirement that structures, systems and components (“SSCs”) important to safety “must be designed to accommodate the

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<sup>6</sup> The regulation further provides that “sites with design basis external events for which adequate protection cannot be provided through ISFSI . . . design shall be deemed unsuitable for the location of the ISFSI.” 10 C.F.R. §§ 72.90(d).

<sup>7</sup> Further, pursuant to 10 C.F.R. § 72.106, a controlled area must be established for any proposed ISFSI, such that any individual located on or beyond the controlled area boundary may not receive “from any design basis accident” a dose in excess of the stated limits.

effects of, and to be compatible with, site characteristics and environmental conditions . . . and to withstand postulated accidents.”<sup>8</sup> See LBP-01-19, slip op. at 17.

## II. Regulatory Guidance Concerning the Standard for Design Basis Events.

The Commission’s regulations in 10 C.F.R. Part 72 do not define explicitly the probability standard by which offsite hazards are to be considered “design basis events” that require consideration within the design basis of a facility.<sup>9</sup> Similarly, no definition of the term “design basis event” appears in the Statement of Consideration which accompanied the final rule;<sup>10</sup> nor is any probability of occurrence assigned to design basis events in NUREG-1567 (“Standard Review Plan for Spent Fuel Dry Storage Facilities”) (March 2000).<sup>11</sup>

Elsewhere, however, the Commission has identified and employed such a standard. For example, in its Policy Statement on Safety Goals pertaining to nuclear reactors, the Commission observed: “Consistent with the traditional defense-in-depth approach and the accident mitigation philosophy requiring performance of containment systems, the overall mean frequency of a large

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<sup>8</sup> An ISFSI applicant is also required to consider appropriate combinations of the effects of normal and accident conditions, and must design the ISFSI “to prevent massive collapse of building structures or the dropping of heavy objects as a result of building structural failure on the spent fuel . . . or on to [SSCs] important to safety.” 10 C.F.R. § 72.122(b)(2)(ii).

<sup>9</sup> In general, Commission regulations require that the design of a facility include consideration of accidents and other events which may be expected to occur during the life of the facility. Such accidents and events are at times referred to as “credible” events which must be included within the design basis of the facility; other events which have a lower likelihood of occurrence are termed “beyond design-basis” events and need not be considered in the design. See *generally*, 10 C.F.R. §§ 72.94(b)-(c), and 72.122(b)(2)(ii).

<sup>10</sup> See Statement of Consideration, “Licensing Requirements for the Storage of Spent Fuel in an Independent Fuel Spent [sic] Storage Installation,” 45 Fed. Reg. 74,693 (1980).

<sup>11</sup> NUREG-1567 establishes four categories of events, including normal conditions, off-normal conditions, and two categories of accident conditions (Design Events I, II, III and IV), which require consideration in the design basis of an ISFSI, following the approach of ANSI/ANS 57.9. See NUREG-1567, at xxviii (“Design Event”). The “design basis” for an ISFSI is defined as “the extreme level of an event or condition for which there is a specified resistance, specified limit of response, or requirement for a specified level of continuing capability. Compares with ‘Design Events’ III and IV of ANSI/ANS 57.9.” *Id.*

release of radioactive materials to the environment from a reactor accident should be less than 1 in 1,000,000 per year of reactor operation.”<sup>12</sup> As the Staff has noted, this translates to a probability of occurrence of  $10^{-6}$  per year. See SER, at 15-77.

Commission case law supports the application of a  $10^{-6}$  standard in defining which accidents are within the design basis for nuclear power plants. See, e.g., *Florida Power and Light Co.* (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB-603, 12 NRC 30, 45 (1980) (accidents with a conservatively calculated probability of  $10^{-6}$  per year or a realistically calculated probability of  $10^{-7}$  per year did not have to be considered in designing a plant, i.e., such accidents are “beyond design-basis” accidents); *Public Service Electric and Gas Co.* (Hope Creek Generating Station, Units 1 and 2), LBP-78-15, 7 NRC 642, 698-99 (1978) (accidents which are expected to occur with “probabilities less than  $1 \times 10^{-6}$ , based on a conservative calculation, may be disregarded in the design basis of a facility,” and the environmental impacts of such low probability accidents are so remote and speculative that they need not be considered under NEPA).

In 1996, the Commission adopted the same regulatory threshold, i.e.,  $1 \times 10^{-6}$  per year, in classifying “Category 2” events at waste handling and storage facilities located at a geologic repository as credible design basis events, when it amended the regulations in 10 C.F.R. Part 60 applicable to such facilities.<sup>13</sup> The Commission determined, “[w]ith regard to the scope of design basis events that should be considered in the license application, . . . events with probabilities of occurrence lower than  $1 \times 10^{-6}$  per year could be screened from further consideration due to their

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<sup>12</sup> Policy Statement, “Safety Goals for the Operations of Nuclear Power Plants,” 51 Fed. Reg. 30,028, 30,031 (1986).

<sup>13</sup> Category 1 events are those natural and man-induced events which are “reasonably likely to occur regularly, moderately frequently, or one or more times before permanent closure of the geologic repository operations area.” Category 2 design basis events are defined as “[o]ther natural and man-induced events that are considered unlikely, but sufficiently credible to warrant consideration, taking into account the potential for significant radiological impacts on public health and safety.” 10 C.F.R. § 60.2 (“Design basis events”).

negligible contribution to individual risk.”<sup>14</sup> In adopting this standard, the Commission noted that “[t]he design bases provided in the rule are for operations at the [Geologic Repository Operations Area (GROA)] . . . . Because operations at the repository are expected to be similar to operations at other facilities licensed by the Commission (e.g., 10 CFR part 72 facilities), the Commission believes that it is appropriate that their design bases be comparable.” 61 Fed. Reg. at 64,262 (emphasis added). In addition, the Commission compared its use of the term “design basis events” for Category 2 events in 10 C.F.R. § 60.136, with the term “design basis accident” in “the corresponding section (i.e., 10 CFR 72.106) in part 72,” and observed that “[t]he change in terminology is not intended to be one of substance.” *Id.* at 64,265.<sup>15</sup> Finally, the Commission stated that “a lower bound of  $1 \times 10^{-6}$  per year is appropriate. Screening out events with probabilities of less than  $1 \times 10^{-6}$  is expected to provide conservative estimates of risk. A higher screening criterion could probably be justified given the magnitude of the consequences and risks from this facility . . . .” *Id.*

More recently, the Commission proposed the adoption of the same standard, *i.e.*, an annual probability of occurrence of  $1 \times 10^{-6}$ , to define design basis accidents for geologic repositories.<sup>16</sup> The Commission noted that its Part 60 regulations “sought, in part, to achieve greater consistency

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<sup>14</sup> Statement of Consideration, “Disposal of High-Level Radioactive Wastes in Geologic Repositories; Design Basis Events,” 61 Fed. Reg. 64,257, 64,258 (1996). Similarly, the Commission indicated that due to the insignificant contribution to the estimated risk of cancer fatality resulting from Category 2 design basis events, “events with probabilities of occurrence lower than  $1 \times 10^{-6}$  per year can be screened from further consideration in repository risk analysis.” *Id.* at 64,261.

<sup>15</sup> In addition, the Commission observed that its adoption of a 0.05 Sv (5 rem) dose limit in Part 60 “as the appropriate design basis for protection of public health and safety from Category 2 design basis events at a GROA . . . will harmonize part 60 with part 72,” and that “part 72 applies to those facilities (MRS installations) most similar to the surface facilities of a repository and for which the kinds of design basis events are also expected to be similar.” 61 Fed. Reg. at 64,265.

<sup>16</sup> Proposed Rule, “Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada,” 64 Fed. Reg. 8640, 8652 (Feb. 22, 1999).

between those criteria and the NRC's licensing requirements for independent storage of spent fuel and [high level waste] at 10 CFR Part 72.” 64 Fed. Reg. at 8640. The Commission observed:

Category 2 design basis events are those events that have at least one chance in 10,000 of occurring before permanent closure. For an operational period of 100 years, this corresponds to an annual probability of occurrence of  $10^{-6}$ . Category 2 design basis events are unlikely, but credible and potentially significant events.

*Id.* at 8644. The Commission further observed as follows (*Id.*):

The Commission incorporated similar definitions of design basis events and associated dose limits in its generic regulations at 10 CFR Part 60 (61 FR 64257) for evaluation of preclosure repository performance. The primary purpose of those most recent amendments to the Commission's generic criteria, in addition to achieving greater consistency with Part 72 requirements, was to improve clarity and sufficiency of the requirements to protect health and safety for the full range of credible conditions or events that could occur at an operating repository, including low-probability events that have potentially serious consequences. The Commission believes that the performance objectives established by these amendments are suitable for inclusion in its proposed criteria for preclosure operation at a Yucca Mountain repository.

In sum, the Commission's recent pronouncements concerning the probability standard to be employed at a geologic repository concluded that use of the same standard -- i.e.,  $10^{-6}$  per year -- is appropriate at both a repository under Part 60 and an MRS under Part 72. These statements support the use of a  $10^{-6}$  standard at the PFS Facility -- which would only transfer spent fuel canisters between casks, and would not remove spent fuel from a canister -- since this type of facility presents less risk than an MRS or GROA at a geologic repository that would handle, process, and/or repackage spent fuel.<sup>17</sup>

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<sup>17</sup> See, e.g., Statement of Consideration, “Emergency Planning Licensing Requirements for Independent Spent Fuel Storage Facilities (ISFSI) and Monitored Retrievable Storage Facilities (MRS),” 60 Fed. Reg. 32,430, 32,431 (1995). The Commission distinguished ISFSIs that do not plan to handle, process, and/or repackage spent fuel, from MRS and ISFSI facilities that plan to conduct such activities. For such other facilities, the Commission adopted enhanced emergency planning provisions, to include a limited offsite component, comparable to the requirements for low power nuclear reactor licensing. See 10 C.F.R. § 72.32(b).

III. Application of the Aircraft Crash Standard in NUREG-0800.

Guidance applicable to the evaluation of aircraft crash hazards at a nuclear power plant is set forth in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants".<sup>18</sup> With respect to aircraft crash hazards, § 3.5.1.6 of NUREG-0800 ("Aircraft Hazards") provides an accepted methodology to estimate the probability of the crash of aircraft onto a nuclear power plant. This guidance indicates that a reactor site, in combination with other factors, "should insure a low risk of public exposure. This requirement is met if the probability of aircraft accidents resulting in radiological consequences greater than 10 CFR Part 100 guidelines is less than about  $10^{-7}$  per year." *Id.*, § 3.5.1.6, at 3.5.1.6-2.<sup>19</sup> Similarly, § 2.2.3 of NUREG-0800 indicates that offsite hazards should be identified as design basis events "if the expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines is estimated to exceed the NRC staff objective of approximately  $10^{-7}$  per year." *Id.*, § 2.2.3 ("Evaluation of Potential Accidents"), at 2.2.3-2. However, § 2.2.3 recognizes that accuracy is sometimes lacking in the information used to estimate probabilities such as an on-site aircraft crash, and it therefore allows an acceptance criterion of  $10^{-6}$ , if reasonable qualitative arguments establish that the actual probability would be lower:

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<sup>18</sup> NUREG-1567, the Standard Review Plan for Spent Fuel Dry Storage Facilities, does not contain its own methodology for conducting aircraft crash hazard analyses or reviews. However, section 2.5.2 ("Nearby Industrial, Transportation, and Military Facilities") directs the Staff to "consider aircraft size, velocity, weight and fuel load in assessing the hazards of aircraft crashes on an installation near an airport." *Id.* at 2-15.

<sup>19</sup> The guidance further establishes three "proximity criteria" by which this  $10^{-7}$  threshold may be considered to be satisfied by inspection; if any of those criteria are not met, or if sufficiently hazardous military activities are identified, a detailed review of aircraft hazards must be performed. NUREG-0800, § 3.5.1.6, at 3.5.1.6-2.

[B]ecause of the low probabilities of the events under consideration, 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."

*Id.*, § 2.2.3 at 2.2.3-2.

This approach was followed in *Consumers Power Co.* (Big Rock Point Nuclear Power Plant), LBP-84-32, 20 NRC 601 (1984), *aff'd*, ALAB-795, 21 NRC 1 (1985). There, the Board recognized that "[a]ccidents of a sufficiently low probability of occurrence may be neglected in reactor design." *Id.* at 641. The Board further stated as follows:

Section 2.2.3, "Evaluation of Potential Accidents", of the Standard Review Plan (NUREG-0800) ("SRP § 2.2.3") provides guidance as to the definition, from a probability standpoint, of those accidents that need not be considered in reactor design. SRP § 2.2.3 provides that accidents, including those involving aircraft, may be neglected in reactor design if the expected rate of occurrence of potential exposures in excess of 10 C.F.R. Part 100 guidelines is below the NRC Staff design objective of approximately  $10^{-7}$  per year. Recognizing the difficulty of performing accurate calculations of the probabilities of low probability events, SRP § 2.2.3 provides further that the expected rate of occurrence of potential accidents in excess of the 10 C.F.R. Part 100 guidelines of approximately  $10^{-6}$  per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability of occurrence can be shown to be lower.

*Id.* The Licensing Board then reviewed the evidence, and found that the cumulative probability of aircraft crashes at Big Rock Point was "about  $2 \times 10^{-6}$ ." The Board concluded:

Although this sum fails to meet the NRC Staff design objective of approximately  $10^{-7}$ , we consider  $2 \times 10^{-6}$  to be "approximately  $10^{-6}$ " as that acceptance standard is used in SRP § 2.2.3. An expected rate of occurrence "of approximately  $10^{-6}$  is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower." (SRP Rev. 2 at 2.2.3-2.).

*Id.* at 651 (emphasis added). The Board then found that a realistic estimate of the cumulative probability of aircraft crashes at the plant was about  $2 \times 10^{-8}$  per year, or about two orders of



magnitude below the upper-bound estimate, which satisfied the criteria for acceptability specified in NUREG-0800, § 2.2.3. *Id.* at 652. Accordingly, the Board concluded that the risk from aircraft to the Big Rock Point plant was sufficiently low that it need not be considered in the design of the plant. *Id.*<sup>20</sup>

While NUREG-0800 applies, in terms, to nuclear reactors, the Staff considers that its guidance and analytical methodology are also useful in evaluating aircraft crash hazards for a stand-alone ISFSI licensed under 10 C.F.R. Part 72. Thus, the Staff stated, in its Safety Evaluation Report for the PFS Facility, that “[t]he Staff reviewed the [PFS] aircraft crash hazard analysis in accordance with NUREG-0800, section 3.5.1.6,” and the Staff “accepts the methodology in NUREG-0800, as applicable, for reviewing the aircraft crash probability for the [PFS] Facility site.”<sup>21</sup>

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<sup>20</sup> See also, *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit No. 2), ALAB-692, 16 NRC 921, 947 (1982) (finding the probability of a heavy aircraft crash into the facility, that causes a release of radioactive materials resulting in dose levels in excess of the 10 C.F.R. Part 100 guidelines, was less than  $1 \times 10^{-7}$ , and such an event need not be included in the design basis of the facility under NUREG-75/087, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants”); *Id.*, ALAB-486, 8 NRC 9, 28, 47-48 (1978) (remanding the proceeding to consider whether the probability of a heavy aircraft crash into the plant exceeds the  $10^{-7}$  standard in NUREG-75/087); *Offshore Power Systems* (Manufacturing License for Floating Nuclear Power Plants), LBP-82-49, 5 NRC 1658, 1713 (1982) (aircraft crash probability on the order of  $10^{-7}$  was sufficiently low as to not be included in the facility design); *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 & 2), LBP-81-24, 14 NRC 175, 219 (1981) (contention rejected as lacking basis, where the applicant calculated an air crash probability of  $6.21 \times 10^{-7}$ , and the alleged facts would not result in a probability greater than the Staff’s standard of  $10^{-6}$ ); *Boston Edison Co.* (Pilgrim Nuclear Power Station, Unit 2) LBP-81-3, 13 NRC 103, 148-50, 208 (1981) ( $10^{-7}$  probability of an aircraft crash was too low to be credible). See also, *Florida Power and Light Co.* (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB-603, 12 NRC 30, 45 (1980) (explaining that under NUREG-75/087, events were to be included in the design basis, “where they have (1) a realistically calculated probability of occurrence of at least  $10^{-7}$  per year or (2) a conservatively calculated probability of  $10^{-6}$  per year”).

<sup>21</sup> “Safety Evaluation Report Concerning the Private Fuel Storage Facility,” issued September 29, 2000, at 15-41. The Staff noted that § 3.5.1.6 of NUREG-0800 “provides three screening criteria that have to be satisfied to conclude, by inspection, that aircraft hazards are less than  $10^{-7}$  per year for accidents that could result in radiological consequences greater than 10 CFR Part 100 exposure guidelines.” Since one of those criteria (pertaining to the number of flights transiting Skull Valley) was exceeded, a detailed review was required to assess the aircraft hazards at the site. *Id.* Such a review is the subject of further proceedings pending before the Board.

Moreover, given the lower comparative risk of a significant radiological release at an ISFSI as compared to a nuclear reactor, the Staff considers that the use of a  $10^{-6}$  probability threshold for aircraft crash hazards at an ISFSI is appropriate. In addition, the Staff considers that this standard is consistent with the Commission's Policy Statement on Safety Goals as well as NUREG-0800. The Staff expressed its view of this matter in the SER for the PFS Facility, in which it stated as follows:

An operating nuclear power plant requires active systems to control the dynamic nuclear and thermal processes that occur in the conversion of nuclear reactions into thermal power. In the event of a mishap, there are large amounts of thermal energy within the reactor core. Emergency cooling systems are provided as part of a reactor facility's design to avoid core damage or meltdown and the release of radioactive material into the environment.

Hazards that have the potential for initiating onsite accidents leading to loss of coolant at a reactor facility should have a sufficiently low probability of occurrence. NUREG-0800, Section 2.2.3, Evaluation of Potential Accidents . . . states a probability of occurrence of approximately  $10^{-7}$  per year as the NRC staff objective, so as to screen out external events that may impact the nuclear reactor and have consequences on the safety of the Facility and the potential for significant radiological impacts on public health and safety. However, data are often not available to permit an accurate estimation of the probabilities of occurrence of the postulated events. Accordingly, pursuant to NUREG-0800, a probability of occurrence of potential radiation exposures in excess of the 10 CFR Part 100 dose guidelines of approximately  $10^{-6}$  per year is acceptable for a nuclear power plant provided, when combined with qualitative arguments, the realistic probability can be shown to be lower. . . . In the Policy Statement on Safety Goals, the Commission noted, "Consistent with the traditional defense-in-depth approach and the accident mitigation philosophy requiring performance of containment systems, the overall mean frequency of a large release of radioactive materials to the environment from a reactor accident should be less than 1 in 1,000,000 per year of reactor operation." This translates to a probability of occurrence of  $10^{-6}$  per year.

Compared to a nuclear reactor facility, an ISFSI is a relatively passive system that does not have complex control requirements and that has contents with relatively low thermal energy. Therefore, potential fuel damage and the associated radioactive source terms from a potential accident are significantly less than that expected from a potential accident at a nuclear reactor facility. As a result, the

estimated consequences from a potential accident at an ISFSI are less severe than from a potential accident at a nuclear reactor facility. Therefore, the staff concludes that a threshold probability of  $1 \times 10^{-6}$  crashes per year is an acceptable value for evaluating aircraft crash hazards at the PFS Facility.

SER at 15-77.

In sum, the Staff has determined that as compared to a nuclear reactor facility, an ISFSI presents a significantly lower potential for fuel damage and the associated radioactive source terms from a potential accident, such that the estimated consequences from a potential accident at an ISFSI are less severe than from a potential accident at a nuclear reactor facility. Accordingly, the Staff has determined that a threshold probability of approximately  $1 \times 10^{-6}$  crashes per year is an acceptable value for evaluating aircraft crash hazards at the PFS Facility, and that this standard is consistent with the Commission's Policy Statement on Safety Goals and NUREG-0800. SER at 15-77.

IV. The Licensing Board Correctly Determined the Aircraft Crash Probability Threshold.

In its decision, the Licensing Board concluded that a probability threshold of  $10^{-6}$  is appropriate in assessing aircraft crash hazards for an ISFSI. See LBP-01-19, slip op. at 18-22. The Board considered the guidance provided in NUREG-0800, as well as the Commission's 1996 Part 60 rulemaking. The Board then concluded as follows:

After reviewing [the parties'] arguments and the Part 60 statement of considerations, it seems to us that PFS and the staff have the better of the argument. Although the State seeks to rely on the lack of a site-specific analysis for the PFS facility, in fact the Commission's discussion in the Part 60 rulemaking regarding the Part 72 facility design basis accidents leads us to believe that it found both were covered by the  $1E-06$  bounding analysis. To be sure, the Commission's most pointed reference was to "surface facilities" at a Part 72 monitored retrievable storage (MRS) installation that, unlike the proposed PFS interim storage facility, could include spent fuel handling and packaging operations. 61 Fed. Reg. at 64,265. Yet, nothing in that rulemaking discussion suggests that the central basis for the State's claimed  $1E-07$  boundary figure -- the consequences of an aircraft crash into a storage cask -- was outside the scope of the matters considered by the Commission in

reaching its bounding conclusion. Whatever may be the differences relative to fuel handling and packaging, as is the case with the PFS ISFSI facility, an MRS will utilize above-ground storage casks. Thus, in accordance with the Commission's guidance in the 1996 Part 60 rulemaking, we will apply the 1E-06 standard outlined therein.

LBP-01-19, slip op. at 20-21 (footnotes omitted).<sup>22</sup>

For the reasons stated above, the Staff submits that the Licensing Board correctly determined that a standard of (approximately)  $10^{-6}$  per year should be applied in assessing the credibility of an offsite hazard at an ISFSI licensed under 10 C.F.R. Part 72. Further, the Licensing Board correctly took notice of the Commission's recent pronouncements in its Part 60 rulemaking proceedings, finding that these regulatory statements support the application of a  $10^{-6}$  probability threshold here. Accordingly, the Staff submits that the Licensing Board's ruling should be affirmed.

#### CONCLUSION

For the reasons set forth above, the Staff submits that the Licensing Board correctly determined that a threshold probability of (approximately)  $10^{-6}$  per year establishes the appropriate regulatory standard for evaluating whether aircraft crashes pose a credible hazard for an ISFSI under 10 C.F.R. Part 72, and that this determination should be affirmed.

Respectfully submitted,

**/RA/**

Sherwin E. Turk  
Counsel for NRC Staff

Dated at Rockville, Maryland  
this 13th day of July 2001

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<sup>22</sup> The Licensing Board recognized that "benchmark probability is an important factor relative to this contention because if, as the State asserts, the figure were found to be 1E-07, based on its current submissions PFS cannot meet this standard relative to the cumulative hazard from aircraft accidents and jettisoned ordnance." LBP-01-19, slip op. at 21 (citing PFS's estimate that the cumulative hazard is 6.25 E-07).

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE L.L.C.	)	Docket No. 72-22-ISFSI
	)	
(Independent Spent	)	
Fuel Storage Installation)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S BRIEF ON THE APPROPRIATE REGULATORY STANDARD TO BE USED IN EVALUATING AIRCRAFT CRASH HAZARDS AT AN INDEPENDENT SPENT FUEL STORAGE INSTALLATION UNDER 10 C.F.R. PART 72," in the above captioned proceeding have been served on the following through deposit in the NRC's internal mail system, with copies by electronic mail, as indicated by an asterisk, or by deposit in the U.S. Postal Service, as indicated by double asterisk, with copies by electronic mail this 13<sup>th</sup> day of July, 2001:

G. Paul Bollwerk, III, Chairman\*  
Administrative Judge  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
(E-mail copy to [GPB@NRC.GOV](mailto:GPB@NRC.GOV))

Dr. Jerry R. Kline\*  
Administrative Judge  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
(E-mail copy to [JRK2@NRC.GOV](mailto:JRK2@NRC.GOV))

Dr. Peter S. Lam\*  
Administrative Judge  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
(E-mail copy to [PSL@NRC.GOV](mailto:PSL@NRC.GOV))

Atomic Safety and Licensing Board  
Panel  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Office of the Secretary\*  
ATTN: Rulemakings and Adjudications  
Staff  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
(E-mail copies to [SECY@NRC.GOV](mailto:SECY@NRC.GOV)  
and [HEARINGDOCKET@NRC.GOV](mailto:HEARINGDOCKET@NRC.GOV))

Office of the Commission Appellate  
Adjudication  
Mail Stop: 16-C-1 OWFN  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

James M. Cutchin, V\*  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
(E-mail to [JMC3@NRC.GOV](mailto:JMC3@NRC.GOV))

Jay E. Silberg, Esq.\*\*  
Ernest Blake, Esq.  
Paul A. Gaukler, Esq.  
Sean Barnett, Esq.  
Shaw Pittman  
2300 N Street, N.W  
Washington, DC 20037-8007  
(E-mail copy to jay\_silberg,  
paul\_gaukler, sean\_barnett, and  
ernest\_blake@shawpittman.com)

Danny Quintana, Esq.\*\*  
Danny Quintana & Associates, P.C.  
68 South Main Street, Suite 600  
Salt Lake City, UT 84101  
(E-mail copy to quintana  
@Xmission.com)

Denise Chancellor, Esq.\*\*  
Fred G. Nelson, Esq.  
Laura Lockhart, Esq.  
Utah Attorney General's Office  
160 East 300 South, 5th Floor  
P.O. Box 140873  
Salt Lake City, UT 84114-0873  
(E-mail copy to [dchancel@State.UT.US](mailto:dchancel@State.UT.US))  
and [jbraxton@email.usertrust.com](mailto:jbraxton@email.usertrust.com)

Connie Nakahara, Esq.\*\*  
Utah Dep't of Environmental Quality  
168 North 1950 West  
P. O. Box 144810  
Salt Lake City, UT 84114-4810  
(E-mail copy to [cnakahar@state.UT.US](mailto:cnakahar@state.UT.US))

Diane Curran, Esq.\*\*  
Harmon, Curran, Spielberg & Eisenberg  
1726 M Street, N.W., Suite 600  
Washington, D.C. 20036  
(E-mail copy to  
[dcurran@harmoncurran.com](mailto:dcurran@harmoncurran.com))

John Paul Kennedy, Sr., Esq.\*\*  
1385 Yale Ave.  
Salt Lake City, UT 84105  
(E-mail copy to [john@kennedys.org](mailto:john@kennedys.org))

Joro Walker, Esq.\*\*  
Land and Water Fund of the Rockies  
1473 South 1100 East, Suite F  
Salt Lake City, UT 84105  
(E-mail copy to [lawfund@inconnect.com](mailto:lawfund@inconnect.com))

Land and Water Fund of the Rockies\*\*  
2260 Baseline Road, Suite 200  
Boulder, CO 80302

Samuel E. Shepley, Esq.  
Steadman & Shepley, LC  
550 South 300 West  
Payson, Utah 84651-2808  
(E-mail copies to: [slawfirm@hotmail.com](mailto:slawfirm@hotmail.com),  
[Steadman&Shepley@usa.com](mailto:Steadman&Shepley@usa.com), and  
[DuncanSteadman@mail.com](mailto:DuncanSteadman@mail.com)

/RA/

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Sherwin E. Turk  
Counsel for NRC Staff