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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION '00 FEB -3 P4:25

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	Docket No. 72-22-ISFSI
PRIVATE FUEL STORAGE, LLC (Independent Spent Fuel Storage Installation)	)	ASLBP No. 97-732-02-ISFSI
	)	January 26, 2000

STATE OF UTAH'S REQUEST FOR ADMISSION OF LATE-FILED MODIFICATION TO BASIS 2 OF UTAH CONTENTION L

Introduction

Pursuant to 10 CFR § 2.714, the State of Utah hereby seeks the admission of late-filed modification to Basis 2 of Utah Contention L to address the NRC Staff's proposal to grant an exemption request to the seismic design standards of 10 CFR § 72.102(f)(1). The exemption would allow the Applicant to use a probabilistic instead of a deterministic methodology to evaluate seismicity at the proposed ISFSI site. In addition, the exemption would allow the Applicant to use a 2,000 year recurrence interval. The State's change being filed today is twofold: first, it modifies the State's basis of Contention L to account for the Staff's proposal to use a probabilistic seismic hazard analysis rather than a deterministic seismic hazard analysis.[1] Second, it takes issue with the use of a 2,000 year return period instead of a 10,000 year return period. This modification to Basis 2 of

[1] The purpose of undertaking a seismic hazard analysis, whether deterministic or probabilistic, is to ascertain the level of ground motion to which a particular structure, system and component is designed. *See, e.g.*, Safety Evaluation Report ("SER") at 2-44.

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Contention L is supported by the Declarations of Dr. Walter J. Arabasz, and Dr. Marvin Resnikoff, which are attached hereto as Exhibits 1 and 2 respectively. As discussed below, this modification to Basis 2 satisfies the Commission's standards for late-filing.

Background

Contention L and its bases were admitted in their entirety by the Licensing Board in LBP-98-7, 47 NRC 142, 191, 253, *aff'd on other grounds,* CLI-98-13, 48 NRC 26 (1998). The State's contention L asserts that: "The Applicant has not demonstrated the suitability of the proposed ISFSI site because the License Application and SAR do not adequately address site and subsurface investigations necessary to determine geologic conditions, potential seismicity, ground motion, soil stability and foundation loading." State of Utah's Contentions on the Construction and Operating License Application by Private Fuel Storage LLC for An Independent Spent Fuel Storage Facility (November 23, 1997) ("State's Contentions") at 80. Contention L and its bases are founded on 10 CFR Part 72, including the requirement to analyze seismicity using deterministic methodology.

Section 72.102(b) of Part 72 requires ISFSI sites "[w]est of the Rocky Mountain Front . . . will be evaluated by the techniques of appendix A of part 100 of this chapter." Appendix A requires a deterministic approach based on a site-specific investigation of the largest credible earthquake likely to affect a site. 10 CFR Part 100, App. A, V(a)(1)(i). As discussed below, in 1997, the NRC amended Part 100 with a new section 100.23 to allow the option of using a probabilistic seismic-hazard methodology.

On June 4, 1998, NRC issued "Rulemaking Plan: Geological and Seismological

Characteristics for Siting and Design of Dry Cask Independent Spent Fuel Storage Installations, 10 CFR Part 72," U.S. NRC SECY-98-126 (hereinafter "Rulemaking Plan" or "SECY-98-126"). The purpose of the rulemaking is to make "a conforming change to 10 CFR 72.102 that will require new applicants for dry cask ISFSIs that are West of the Rocky Mountain Front ... to evaluate seismicity by the techniques of Part 100 as amended in 1997, specifically Part 100.23 (instead of 10 CFR 100 Appendix A)." SECY-98-126 at 2. Under the preferred option in the Rulemaking Plan, a Part 72 licensee would be required to "conform to 10 CFR 100.23 in lieu of 10 CFR Part 100 Appendix A" and a licensee could use a "graded approach to seismic design for ISFSI structures, systems, and components." Rulemaking Plan at 4. In general, the graded approach to structures, systems, and components ("SSCs") "requires those SSCs, whose failure would result in a greater accident consequence, to use higher design requirements for phenomena such as earthquakes and tornadoes." Id.

The Rulemaking Plan would allow a probabilistic seismic hazard assessment and require that systems, structures, and components to be designed to withstand either a Frequency-Category-1 design basis ground motion (1,000 year recurrence interval) or a Frequency-Category-2 design basis ground motion (10,000 year recurrence interval). Rulemaking Plan at 5. The Rulemaking Plan does not have intermediate categories between Categories 1 and 2. PFS has classified the following SSCs as important to safety: the canister; the concrete storage cask; the transfer cask; the lifting devices; the cask storage pads; the canister transfer building; and the canister transfer cranes. SAR at

3-4-3 to 4 (Rev. 0).

On April 2, 1999, the Applicant requested an exemption from the requirements of 10 CFR § 72.102(f)(1) and requested approval to conduct a probabilistic seismic hazard analysis instead of a deterministic analysis as required by the rules. "Request for Exemption to 10 CFR 72.102(f)(1), Seismic Design Requirement, Docket No. 72-22/Tac No. L22462, Private Fuel Storage, Private Fuel Storage L.L.C," addressed to Mark Delligatti at NRC's Spent Fuel Project Office. In response to the Applicant's exemption request, the State, on April 30, 1999, filed a Motion Requiring Applicant to Apply for Rule Waiver Under 10 CFR § 2.758(b) or in the Alternative Amendment to Utah Contention L ("State Motion"). The Board denied the State's Motion to require the Applicant to apply to the Board for a rule waiver. LBP-99-21 at 11-12 (May 26, 1999). In addition, the Board found "that the question of admitting or amending contentions relative to the PFS exemption request must await favorable staff action on that request." Id. at 12. Thus, the Board denied, without prejudice, the State's request to amend contention L. Id. at11-12.

In its original exemption request, the Applicant submitted its design basis ground motion based on a 1,000 year recurrence interval. Exemption Request at 2. However, on August 24, 1999, the Applicant substituted a 2,000 year recurrence interval for the 1,000 year recurrence interval in the initial exemption request. "Request for Exemption to 10 CFR 72.102(f)(1), Seismic Design Requirement, Docket No. 72-33/Tac No. L22462, Private Fuel Storage Facility, Private Fuel Storage L.L.C," addressed to U.S. Nuclear

Regulatory Commission, Document Control Desk.

The Staff issued a Safety Evaluation Report, dated December 15, 1999.[2] In Chapter 2 of the SER, the Staff recognized that Part 72 currently requires a deterministic analysis for sites west of the Rocky Mountain Front. SER at 2-43. The Staff also recognized that the NRC Rulemaking Plan for 10 CFR Part 72 (Nuclear Regulatory Commission 1998a) requires the following:

> [A]n individual structure, system, and component may be designed to withstand only Frequence Category 1 events(1,000-year return period) if the applicant's analysis provides reasonable assurance that the failure of the structure, system, and component will not cause the Facility to exceed the radiological requirements of 10 CFR 72.104(a). If the applicant's analysis cannot support this conclusion, then the designated structures, systems and component should have a higher importance to safety, and the structures, systems, and components should be designed such that the Facility can withstand Frequency Category 2 events (10,000-year return period).

SER at 2-44. In the SER, however, the Staff does not discuss the applicability of the Rulemaking Plan to its grant of the Applicant's seismic exemption request. Id.

Apparently, the Staff has granted the Applicant's exemption request to use a probabilistic analysis ("PSHA") based on a 2,000 year return period.[3] SER at 45. The

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[2] As discussed in the "Late Filed Factors," the copy of the SER served on the State was not received until December 27, 1999.

[3] "[T]he staff concludes that additional analyses are needed to assess ground vibrations of the Facility and to approve the applicant's request for an exemption to 10 CFR 72.102(f)(1). The staff agrees that the use of the PSHA methodology is acceptable, however, the SAR analyses need to be revised to consider a 2,000-year return period, rather than a 1,000-year return period." SER at 2-45.

Staff, however, does not base its decision to grant the exemption request on the NRC Rulemaking Plan for Part 72. Instead the Staff says "a 2,000-year return value with the PSHA methodology can be acceptable" for four reasons: (1) the 2,000 year return period meets the performance standards used by the U.S. Department of Energy (DOE) for DOE Category-3 facilities; (2) by comparison to the probability level of non-exceedance ground motion values said to be used for building codes (90-percent probability of not being exceeded in 50 years), the Staff judges that a 2,000-year return period for a dry spent fuel storage facility is adequate because it implies design ground motions that have a 99-percent probability of not being exceeded in a 20-year licensing period; (3) an exemption request granted to the DOE for the TMI-2 ISFSI located at INEEL used a 2,000 year return period; and (4) the conclusion in the Applicant's Fault Evaluation Study and Seismic Hazard Assessment Study performed by Geomatrix Consultants that a 2,000 year return period corresponds to an appropriate design probability level. SER at 2-44 to 45. In the SER, the Staff rejects the Applicant's initial seismic exemption request by concluding: the Staff "reviewed the applicant's request and supporting analysis to use the 1,000-year return period value and does not find this value acceptable..." SER at 2-44.

MODIFICATION TO BASIS 2 OF UTAH CONTENTION L:

Basis 2 of Contention L addresses ground motion and states:

> **Ground motion**. The site may also be subject to ground motions greater than those anticipated by the Applicant due to spatial variations in ground motion amplitude and duration because of near surface traces of potentially capable faults (the Stansbury and Cedar Mountain faults). Sommerville, P.G., Smith, N.F., Graves, R.W., and Abrahamson, N.A.,

Modification of empirical strong ground motion attenuation relations to include the amplitude and duration effects of rupture directivity, *in* 68 Seismological Research Letters (No. 1) 199 (1997). Failure to adequately assess ground motion places undue risk on the public and the environment and fails to comply with 10 C.F.R. § 72.102(c).

State of Utah Contentions at 82-83. Basis 2 is founded on 10 CFR Part 72 which requires an analysis using deterministic methodology. The Staff has now granted the Applicant an exemption from 10 CFR § 72.102(c) which will allow the use of probabilistic methodology with a return period of 2,000 years. SER at 2-45. Accordingly, the State seeks to modify Basis 2 of Contention L to require either the use of a probabilistic methodology with a return period of 10,000 years or compliance with the deterministic analysis as currently required by 10 CFR § 72.012(c). Thus, in Basis 2, the State now alleges that the Applicant has not complied with either 10 CFR § 72.102(c) or Frequency Category 2 events (10,000 year return period) in the NRC Rulemaking Plan in its assessment of ground motion, thereby placing undue risk on the public and the environment.

As discussed below, the Staff's grant of the exemption request does not comport with the conceptual change proposed by NRC to amend Part 72 in NRC's Rulemaking Plan. Furthermore, the rationale for the Staff's grant of the exemption request is arbitrary, capricious and not in accordance with law.

A. The Grant of the Exemption Request Fails to Comply with the NRC Rulemaking Plan.

The Staff's approval of the exemption request is contingent upon use of a 2,000

year return interval. SER at 2-45. The Staff's justification for allowing the SSCs to be designed to withstand a 2,000 year return interval contradicts the Commission's Part 72 Rulemaking Plan.

In applying a graded approach to seismic design for SSCs, as discussed earlier, the NRC Rulemaking Plan only provides two alternatives, either a Frequency-Category-1 design basis ground motion (1,000 year return period) or a Frequency-Category-2 design basis ground motion (10,000 year return period). Rulemaking Plan at 5. SSCs may be designed to withstand a 1,000 year return period event if there is reasonable assurance that the failure of the SSC will not cause the facility to exceed the radiological standards in 10 CFR § 72.104(a). Id. If the failure of the SSC will exceed the standards of 10 CFR § 72.104(a), then the SSC must be designed to withstand a 10,000 year return period event. The Staff correctly rejects the Applicant's request to design the SSCs to withstand a 1,000 year return period event. SER at 2-44.

However, under the Rulemaking Plan the Applicant is required to design the facility to withstand a 10,000 year return period event. The Rulemaking Plan does not offer any intermediate or hybrid alternative such as a design basis to withstand a 2,000 year return period. The Staff recognizes, but apparently ignores, that the options offered in the Rulemaking Plan are either a 1,000 or 10,000 year return period. SER at 2-44.

Thus, under the Staff's new approach to seismic hazard analysis, the Applicant will not be required to comply with Part 72 regulations that are currently in effect. Nor will the Applicant be required to comply with the Commission's formal plan to amend

Part 72. Instead, the Staff has compiled a grab bag of reasons to support an ad hoc standard that has no foundation in NRC's current or proposed rules that have been approved by the Commission. The Staff's rationale is not only arbitrary and capricious but also has serious technical and logical flaws.

The Staff's approach is in error for several reasons. First, the Staff's justification for accepting a 2,000 year return period does not address the radiological consequences of a failed design. Under the Rulemaking Plan, if failure of the SSC exceeds the radiological requirements of 10 CFR § 72.104(a)[4] then the SSC "must have a higher importance to safety, and the SSC must be designed such that the facility can withstand Frequency-Category-2 events [10,000 year return period] without impairing the ISFSI's capability to perform safety functions and without exceeding the radiological requirements of 10 C.F.R. § 72.106(b)." Rulemaking Plan at 5. The entire basis for allowing a graded approach to seismic design rests in the projected radiological consequences of a failed SSC. Thus, the radiological requirements of 10 CFR § 72.104(a) cannot be ignored.

Second, PFS has not demonstrated that either (a) the design of the PFS facility will provide adequate protection against an exceedance of the dose limits in section 72.104(a), or (b) the equipment is designed to withstand a 2,000 year recurrence

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[4]10 CFR § 72.104(a) states that "[d]uring normal operation and anticipated occurrences, the annual dose equivalent to any real individual who is located beyond the controlled area must not exceed 0.25 mSv (25 mrem) to the whole body, 0.75 mSv (75 mrem) to the thyroid and 0.25 mSv (25 mrem) to any other critical organ as a result of exposure . . ."

earthquake. For example, PFS has not provided an adequate assurance that the equipment in the Canister Transfer building is adequately designed to protect against a radiological release that exceeds NRC standards. The Canister Transfer Building, where fuel is transferred from transportation casks to storage casks, is a Category 1 SSC. SAR at 3-4-4, Rev. 0. The transfer operations consist of using the HI-TRAC overpack to transfer a canister from a HISTAR transportation cask to the HI-STORM concrete storage cask. *See* SAR § 5.1.4.2. The fuel in the HI-TRAC overpack is lowered 16 feet into the HI-STORM storage cask.

When the loaded HI-TRAC overpack is about to be lowered into the HI-STORM cask, the canister and contained fuel are the most vulnerable, because the canister no longer has the protection of the transportation cask. While the canister plus the transportation cask is designed to withstand a 30 foot drop, the loaded canister and HI-TRAC overpack are not designed to withstand such an impact. The HI-TRAC transfer cask is designed to withstand a drop from a horizontal lift height of 42 inches[5], considerably less therefore than the 16 foot height of the HI-STORM cask. Resnikoff Dec. at ¶ 4. This is at least, in part, because the HI-TRAC overpack does not have impact limiters. Thus, the design of the loaded HI-TRAC overpack is not adequate to assure that a drop will not cause an exceedance of the NRC dose limits. PFS is relying on the single failure-proof crane to prevent a drop of the HI-TRAC, but safety cannot be assured if the

[5] Table 2.2.8, HI-STORM TSAR, Holtec.

crane fails in a 2,000-year return earthquake. For this reason, the Canister Transfer Building's design basis should be designed to withstand a 10,000 year return period earthquake.

Furthermore, there are other reasons why the facility may exceed NRC dose limits. For example, PFS's accident evaluation does not bound the design basis accident because the accidents considered by PFS are not design basis accident DE IV under ANSI/ANS-57.9-1999. In addition, the assumed accident leak rate is too small and the assumed breach hole in the canister considered by PFS is too small. This leakage rate is consistent with Table 4-1, NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," that is based on another NRC document, NUREG/CR-6487, "Containment Analysis for Type B Packages Used to Transport Various Contents."[6] Resnikoff Dec. at ¶ 4.

The leakage rate and calculation methodology in NUREG/CR-6487 are based on ANSI standard N14.5 for transportation casks.[7] But the assumed leakage rate is not conservative because it is based on testing requirements that will not be met for storage casks. ANSI standard N14.5 assumes[8] that casks will be leak-tested periodically, before shipment and after maintenance and repair. But some ISFSIs, such as the PFS facility,

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[6] Anderson, BL et al, "Containment Analysis for Type B Packages Used to Transport Various Contents," Lawrence Livermore National Laboratory, NUREG/CR-6487, November 1996.
[7] NUREG/CR-6487, p. 1.
[8] American National Standards Institute, ANSI N14.5, "Leakage Tests on Packages for Shipment," Table 1.

have no provisions for testing helium leakage during storage and no provisions for repairing and maintaining casks and testing for leakage after repair and maintenance. Thus, these ISFSIs cannot satisfy the leak testing requirements of N14.5, and NUREG-1617 should not be used. Resnikoff Dec. at ¶ 7.

Further, the methodology employed in NUREG/CR-6487 may not apply for certain accidents that exceed the design basis accident. NUREG/CR-6487 calculates the leak hole diameter that corresponds to a regulatory-allowable release rate under accident conditions. This leak hole size can easily be exceeded in accidents involving sabotage. Impact with a MILAN or TOW-2 hand held anti-tank device can produce a leak hole larger than calculated in NUREG/CR-6487. Resnikoff Dec. at ¶ 8.

Third, as discussed in the following section, the Staff's reliance on DOE performance Category 3 facilities for the use of a 2,000 year return period is inconsistent with the Rulemaking Plan.

B. The Staff's Four Reasons for Allowing the Applicant to Use a Probalistic Analysis with a 2,000 Year Return Period Are Seriously Flawed.

In the SER, the Staff did not rely on the NRC Rulemaking Plan to approve the use of a probabilistic methodology with a 2,000 year return period. SER at 2-44. In addition to non-compliance with the Rulemaking Plan, and the radiological requirements and consequences, which pose serious problems for the Staff's approach, each of the four justifications presented by the Staff for determining "that a 2,000-year return value with the PSHA methodology can be acceptable" (SER at 2-44) is flawed. Each justification is

addressed sequentially.

1. The DOE Standard for DOE performance Category-3 Facilities

The Staff's first justification is:

> The DOE standard, DOE-STD-1020-94 (U.S. Department of Energy, 1994), defines four performance categories for structures, systems, and components important to safety. The DOE standard requires that performance category-3 facilities be designed for the mean ground motion with a 2,000-year return period. Category-3 facilities in the DOE standard have potential accident consequences similar to a dry spent fuel storage facility."

SER at 2-44.

The Staff claims that potential accident consequences of ISFSIs are similar to DOE performance category-3 facilities. Id. In its Rulemaking Plan to amend Part 72, the NRC relies on the technical basis it used to change Part 100 to support changes to Part 72. Rulemaking Plan at 5. The Plan also discussed the Part 60 design basis event rulemaking for a geologic repository, and mentions that in the Part 60 rulemaking NRC "adopted a graded approach similar to DOE standard 1020." Id. However, the Rulemaking Plan categorically did not adopt the various DOE facility performance categories, including the category corresponding to a 2,000-year return period. Rulemaking Plan at 5. The Plan requires either a 1,000 year return period for Frequency-Category-1 design basis events or a 10,000 year return period for Frequency-Category-2 design basis events. Id. at 4-5.

2. The Uniform Building Code and National Earthquake Hazards Reduction Program

The second justification offered by the Staff states:

> The Uniform Building Code and the National Earthquake Hazards Reduction Program (International Conference of Building Officials, 1994; Building Seismic Safety Council, 1995) both recommend using peak ground motion values that have a 90-percent probability of not being exceeded in 50 years for the seismic design of structures.... [C]onservative peak ground motion values that have a 99 percent likelihood of not being exceeded in the 20-year licensing period of the Facility are considered adequate for its seismic design.[9] This exceedance probability corresponds to a return period of 2,000 years.

SER at 2-45.

The building-code documents and standards cited by the Staff are outdated and have been superseded by subsequent code development leading to more stringent requirements. Further, comparison to these codes for a nuclear waste facility is misleading. The stated purpose of the Uniform Building Code is "to provide minimum standards to safeguard life or limb, health, property, and public welfare...." International Conference of Building Officials, *Uniform Building Code*, Whittier, California: Vol. 1, Sec. 101.2, 1-1 (1997) (*emphasis added).*

Under the National Earthquake Hazards Reduction Program ("NEHRP") there has been continuing revision of the *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* through the Building Seismic Safety Council. National Earthquake Hazards Reduction Program, *NEHRP, Partners in Earthquake Mitigation: Report to Congress, Fiscal Years 1997 and 1998* (1999) at 31. The most recent released version of NEHRP *'s* recommended provisions is the 1997

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[9] The licensing period will likely be 40 years or more.

version: Building Seismic Safety Council, *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*, Washington, DC: 2 Vols., FEMA Publication 302 and 303 (1997) (hereafter "1997 Provisions"). The 1997 Provisions supersedes the 1994 edition in several significant ways and forms the basis for a new 2000 International Building Code, which will replace the Uniform Building Code and other model building codes in the United States. *NEHRP, Partners in Earthquake Mitigation: Report to Congress, Fiscal Years 1997 and 1998* (1999) at 31-34.

In the 1997 Provisions, (1) response spectral values are used to represent the ground motions for design, (2) "the maximum considered earthquake ground motion is defined with a uniform likelihood of exceedance of 2 percent in 50 years (return period of about 2500 years)", and (3) the design earthquake ground motion is selected at 2/3 of the maximum considered earthquake ground motion. 1997 Provisions, Part 2 at 37. These same guidelines are contained in a draft version of the International Building Code 2000. International Code Council, *2000 International Building Code—First Draft*: Birmingham, Alabama (1997). While the design earthquake ground motion is selected at two thirds of the maximum considered earthquake ground motion (2500-year return period), essential buildings and structures are assigned an importance factor of 1.5, which then increases the seismic design requirements. Id. at Sec. 1613. At face value, a return period of 2,000 years and design ground motions that have a 99-percent probability of not being exceeded in 20 years at PFS's ISFSI appear to be highly conservative. But the level of conservatism is simply comparable to the design ground motion levels now planned to

be required for ordinary building construction. Design ground motions for essential buildings and structures under the 1997 Provisions and the 2000 International Building Code, as shown above, approach the maximum considered earthquake ground motions for a 2,500-year return period (which implies a 99.2-percent probability of non-exceedance in 20 years or 98.0 percent in 50 years). Therefore, the Staff's reliance on the Uniform Building Code and the National Earthquake Hazards Reduction Program does not support the Staff's justification for the use of a 2,000 year return period.

3. DOE's TMI-2 ISFSI Facility Exemption

The third justification is based on the Staff's grant of a previous exemption to the existing regulations. Simply because the Staff has granted an exemption in the past does not mean that the exemption becomes the rule by which NRC evaluates seismic hazards. The third justification is:

> The NRC has accepted a design seismic value that envelops the 50th-percentile deterministic ground motion value and the 2,000-year return period probabilistic ground motion value for the TMI-2 ISFSI facility license. . . The applicant's 2,000-year PSHA response spectra generally envelops the 50th-percentile updated DSHA response spectra (Stamatakos et. al., 1999). . .

SER at 2-45.

If the NRC is to use the 50th-percentile deterministic ground motion value at the PFS site as a baseline for evaluating probabilistic ground motion values for certain return periods, then the baseline must be valid. The State has earlier documented its argument that the Applicant has not performed a DSHA (deterministic seismic hazard analysis) in

accordance with the requirements of 10 CFR § 72.102(f)(1) — either in its 1997 SAR or in the update of the DSHA performed by Geomatrix Consultants, Inc. in April 1999. *See* State of Utah's Motion Requiring Applicant to Apply for Rule Waiver Under 10 CFR § 2.758(b) or in the Alternative Amendment to Utah Contention L," April 30, 1999. In both analyses, Geomatrix Consultants, Inc. deviated from established deterministic methodology for assessing design ground motions from the maximum event by incorporating probabilistic approaches for maximum magnitude, minimum source-to-site distance, and attenuation relationships. Id. at 4. Ground-motion values determined by the hybrid deterministic-probabilistic methodology would expectedly be lower than those using established deterministic methodology. Thus, the underlying premise of the Staff's third justification -- that PFS has conducted a complete deterministic analysis -- is wrong.

The Staff, relying on an independent report, notes that "[t]he applicant's 2,000-year PSHA response spectra generally envelops the 50th-percentile updated DSHA response spectra (Stamatakos et al., 1999)." SER at 2-45. The State has just become aware through the SER that the Staff claims to have conducted an independent technical review of the Applicant's seismic hazard investigations, cited in the SER as Stamatakos et al., 1999. SER at 2-36. The State does not have a copy of the report by Stamatakos et al. but intends to obtain a copy from the Staff through discovery. Without the report in hand, it is unclear what is meant by "generally envelops" and whether the updated DSHA referred to by the Staff is the one done by Geomatrix Consultants, Inc. using the hybrid methodology or one done independently by Stamatakos et al. The State has reviewed all

relevant information submitted to date by Geomatrix, and the same hybrid methodology still exists in the Geomatrix reports. Furthermore, the Staff does not say in the SER that Stamatakos et al have conducted an independent DSHA. The Stamatakos report is also critical to enable the State to evaluate other key information relied on by the Staff in the SER, including "an independent evaluation of seismic ground motion hazard at the site" (SER at 2-1), "alternative interpretation [of fault sources] based on independent modeling of gravity data" (SER at 2-31), and "details of ... the staff's independent sensitivity analyses" (SER at 2-38).

4. The Geomatrix Report

The final justification offered by the Staff is the following:

> In its Fault Evaluation Study and Seismic Hazard Assessment Study—Final Report for the site, Geomatrix Consultants, Inc. (1999a) concluded that an appropriate design probability level for both vibratory ground motion and fault displacement for the site is 5×10^{-4} (or a 2,000-year return period).

SER at 2-45.

This justification put forward by the Staff to support its determination "that a 2,000-year return value with the PSHA methodology can be acceptable" (SER at 2-44) is patently based on circular reasoning. The basis for the stated conclusion by Geomatrix Consultants, Inc. regarding the appropriate design probability level is "indirect guidance from the Staff regarding the appropriate probability level for seismic design." Geomatrix Consultants, Inc., *Final Report, Fault Evaluation Study and Seismic Hazard Assessment, Private Fuel Storage, Skull Valley, Utah* (February 1999) at 55.

The authors of the Geomatrix report present two regulatory precedents. First, they describe the Staff exemption for the TMI-2 ISFSI, noting the acceptance of a 2,000-year return period for the design earthquake ground motion, corresponding to a peak ground acceleration of 0.35g and a probability level of approximately 5×10^{-4} per year. Id. Second, they note the use of a probabilistic, risk-graded approach in the 10 CFR Part 60 Design Basis Event rulemaking, which suggested the appropriateness of a 1,000-year return period for radiological consequences less than 1 mSv (100 mrem). Id. at 55-56. They then state: "Based on the above arguments for a risk-informed graded approach, we conclude that an appropriate design probability level for the PFSF site is 5×10^{-4} (2,000-year return period). Id. at 56. Thus, the Geomatrix Report does not offer an independent justification for the Staff's action because the Report is based on guidance from the Staff, the TMI-2 ISFSI exemption (the Staff's second justification), and a 1,000 year return period rejected by the Staff.

Late Filed Factors

The State meets the 10 CFR § 2.714(a) late filed factors for amending its contention.

Good Cause: The State has good cause for the late filing. First, the State attempted to amend Contention L after the Applicant filed for its exemption request. *See* page 4 above. The Board ruled that the State's action was premature and that it must await action by the Staff on the exemption request. Id. The Staff appears to have taken affirmative action to grant the exemption request. SER at 2-45.

The Board indicated that late-filed contentions should be submitted no later than thirty days after the SER is made available to the public. Memorandum and Order (General Schedule for Proceeding and Associated Guidance), at 5 (June 29, 1998). In its order, the Board requested that the Staff notify the intervenors of "its intent to make the [SER] publicly available no later than fifteen days before the [SER is] issued publicly." *Id.* When the Staff filed the Statement of Its Position Concerning Group I-II Contentions on December 15, 1999, the Staff mentioned that the SER was being issued on the same date. On or about December 15, 1999, the State requested a copy of the SER from the Staff and was told that the SER had been sent to the printers and that the State, along with others on the service list, would be served with a copy after the SER was printed.[10] Thus, the State did not receive 15 days advance notice that the Staff was about the issue the SER. Furthermore, the Staff's December 15, 1999 SER left open Contention L and did not mention status of the exemption request. The State only learned of the Staff's decision on the seismic exemption request when it was served with a copy of the SER. While, the SER is dated December 15, 1999, the State did not receive a copy of the SER until December 27, 1999.

In its ruling on the State's Motion, the Board indicated that the "timeliness of a contention based on an Applicant's exemption request is more properly judged from the time of staff action on the exemption rather than when the exemption request is filed."

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[10]Telephone conversation between counsel for the Staff and counsel for the State.

LBP-99-21 at 10. To the extent that the Board finds that the Staff has now not taken action of the exemption request (with a return period interval of 2,000 years), the State's amendment is being filed within 30 days of receipt of the SER and is timely.

Development of a Sound Record: The State's participation will assist in developing a sound record. In particular, testimony by Dr. Arabasz will give the Board another perspective on the Applicant's seismic hazard analysis. Dr. Arabasz is a recognized expert in the field of earthquake hazard evaluation and has extensive experience with probabilistic seismic hazard analysis. He has 30 years professional experience in scientific research, occasional teaching, consulting, and publishing articles in observational seismology, seismotectonics, and earthquake hazard analysis, with a primary focus on Utah and the Intermountain West. Since 1977 he has routinely provided professional consulting services on earthquake hazard evaluations for dams, nuclear facilities, and other critical structures. During the past decade he has had major involvement in assessing vibratory and fault-displacement hazards for the high-level nuclear waste repository at Yucca Mountain, including peer review, review of technical reports, and serving on expert teams for seismic source characterization for probabilistic hazard analyses. His service on numerous national and state advisory boards and panels has included — relevant to this filing — his serving on the National Research Council's Panel on Seismic Hazard Evaluation (1992-96), the Utah Seismic Safety Commission (currently as chair) since 1994, and numerous NEHRP panels and work groups since the early 1980s. As the foregoing shows, Dr. Arabasz has the expertise and experience to

present testimony explaining why the Staff's justification for granting the Application's seismic exemption request is based on an incorrect technical foundation and outdated and inappropriate standards. *See also*, Arabasz Dec. at ¶ 5.

In addition to Dr. Arabasz's expertise, the State will offer testimony by Dr. Marvin Resnikoff with respect to the potential for SSCs at PFS to exceed Part 72 dose limits. As is evident from numerous other filings in this proceeding, Dr. Resnikoff has extensive experience with radiation dose analysis and the integrity and safety of spent fuel storage casks systems. Dr. Resnikoff's testimony is described in ¶¶ 4-9 of his Declaration.

Availability of Other Means for Protecting The State's Interests: The State has no alternative means, other than this proceeding, for protecting its interest. The State previously attempted to amend Contention L to reflect the seismic exemption request, but the Board determined that the issue was not ripe and that the State should address the issue once the Staff has taken action.

Representation by Another Party: The State's position will not be represented by any other party, as there is no other party with a similar contention admitted to this proceeding.

Broadening of Issues or Delay of the Proceeding: The admission of Amended Contention L will not unduly broaden or delay the proceeding. In fact, this request will focus the issues under Contention L to reflect the standards under which the Staff

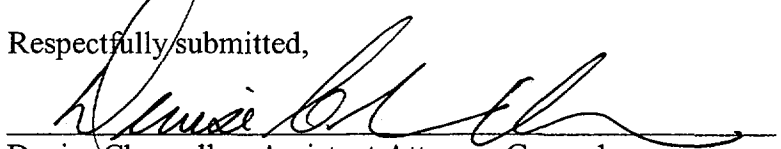
evaluates the Applicant's seismic design basis.[11]

Conclusion

For the foregoing reasons, modification to Basis 2 of Utah Contention L is both admissible and meets the Commission's standard for late filed contentions. Accordingly, it should be admitted.

DATED this 26th day of January 2000.

Respectfully submitted,



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[11]The State is still confused why it, rather than the Applicant through a Rule Waiver Petition, must bear the burden of getting before the Board in this proceeding, the Staff's grant of an exemption to a rule upon which part of the basis of an admitted contention is pending before the Board.

CERTIFICATE OF SERVICE

I hereby certify that a copy of STATE OF UTAH'S REQUEST FOR ADMISSION OF LATE-FILED AMENDED UTAH CONTENTION L_A was served on the persons listed below by electronic mail (unless otherwise noted) with conforming copies by United States mail first class, this 26th day of January 2000:

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Denise Chancellor
Assistant Attorney General
State of Utah

EXHIBIT 1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	Docket No. 72-22-ISFSI
PRIVATE FUEL STORAGE, LLC (Independent Spent Fuel Storage Installation)	)	ASLBP No. 97-732-02-ISFSI
	)	January 26, 2000

DECLARATION OF DR. WALTER J. ARABASZ IN SUPPORT OF STATE OF UTAH'S REQUEST FOR ADMISSION OF LATE-FILED MODIFICATION TO BASIS 2 OF UTAH CONTENTION L

I, Dr. Walter J. Arabasz, declare under penalty of perjury that:

1. I am Research Professor of Geology and Geophysics and Director, University of Utah Seismograph Stations; University of Utah, Salt Lake City, Utah. I have 30 years professional experience in scientific research, occasional teaching, consulting, and publishing articles in observational seismology, seismotectonics, and earthquake hazard analysis with a primary focus on Utah and the Intermountain West. My curriculum vitae, attached hereto as Exhibit A, gives greater detail about my professional qualifications, experience and publications.

2. I am familiar with Private Fuel Storage's ("PFS's") license application and Safety Analysis Report in this proceeding, and other information submitted by the Applicant with respect to earthquake hazards. I am also familiar with NRC regulations, Rulemaking Plan to amend Part 72, guidance documents, the methodologies for earthquake hazard evaluation and new developments in the field of earthquake hazard evaluation. Furthermore, during the past decade I have had a significant involvement in assessing vibratory and fault-displacement hazards for the Yucca Mountain high-level nuclear waste repository and I have also served on the National Research Council's Panel on Seismic Hazard Evaluation.

3. I assisted in the preparation of State of Utah's Request for Admission of Late-Filed Modification to Basis 2 of Utah Contention L, filed on January 26, 2000 ("Modification to Basis 2"), with the exception of the portion of the document that relates to dose limits.

4. As stated in Modification to Basis 2, Section B, the four justifications offered by the Staff to approve the Applicant's use of a probabilistic seismic hazard analysis with a 2,000 year return period are technically flawed. I have reviewed Section B and statements and conclusions therein are true to the best of my knowledge, information and belief.

5. If Modification to Basis 2 is admitted, I am prepared to provide expert testimony regarding these matters. I expect that my testimony would follow the general statements and conclusions in Section B of the Modification. Moreover, I would provide additional testimony based on information gathered in discovery, in particular the Stamatakos et. al report relied on by the Staff for its technical review of the Applicant's seismic hazard investigation.

_____

Dr. Walter J. Arabasz

January 26, 2000

4. As stated in Modification to Basis 2, Section B, the four justifications offered by the Staff to approve the Applicant's use of a probabilistic seismic hazard analysis with a 2,000 year return period are technically flawed. I have reviewed Section B and statements and conclusions therein are true to the best of my knowledge, information and belief.

5. If Modification to Basis 2 is admitted, I am prepared to provide expert testimony regarding these matters. I expect that my testimony would follow the general statements and conclusions in Section B of the Modification. Moreover, I would provide additional testimony based on information gathered in discovery, in particular the Stamatakos et. al report relied on by the Staff for its technical review of the Applicant's seismic hazard investigation.

Dr. Walter J. Arabasz

January 26, 2000

WALTER J. ARABASZ

Birthplace and Date: Acushnet, Massachusetts, September 30, 1942.

Current Position: Research Professor of Geology and Geophysics and Director, University of Utah Seismograph Stations; University of Utah, Salt Lake City, Utah.

Address: 135 S 1460 E Rm 705 WBB, University of Utah, Salt Lake City, Utah 84112;
Tel: 801-581-7410; Fax: 801-585-5585; E-mail: arabasz@seis.utah.edu.

Education: B.S., Geology, summa cum laude, Boston College, 1964; M.S., Geology, California Institute of Technology, 1966; Ph.D., Geology (minor in geophysics), California Institute of Technology, 1971. Dissertation (supervised by Professor Clarence R. Allen): *Geological and Geophysical Studies of the Atacama Fault Zone in Northern Chile.*

Professional Positions: Post-Doctoral Research Fellow, Dept. of Scientific and Industrial Research, Geophysics Division, Wellington, New Zealand, 1970-73; Research Scientist, Lamont-Doherty Geological Observatory, 1973-74; University of Utah (1974-present): Research Professor of Geology and Geophysics (since 1983); Director, University of Utah Seismograph Stations (since 1985).

Society Affiliations: Seismological Society of America; American Geophysical Union; Geological Society of America; Earthquake Engineering Research Institute; Utah Geological Association.

Current Professional Activities: Chair, Utah Seismic Safety Commission; Member, Executive Committee, and past Chair, Council of the National Seismic System; Member, Senior Advisory Group to U.S. Geological Survey for 1999 Report to Congress on an Assessment of Seismic Monitoring in the United States; Corresponding Member, U.S. Committee for Advancement of Strong Motion Programs; Visiting Member, Infrastructure Protection Group, Utah Olympic Public Safety Committee; Member, Utah Interagency Technical Team (serving the Utah Division of Comprehensive Emergency Management).

General Statement of Experience: *Dr. Walter J. Arabasz* has nearly 30 years of professional experience in research, project management, consulting, and occasional teaching in observational seismology, tectonics, and earthquake hazard evaluation. He is the author or co-author of 36 published papers, 69 published abstracts and numerous technical reports. His present responsibilities at the University of Utah include seismological research and extensive project management—chiefly relating to the operation and modernization of a 100-station regional seismic network covering Utah and neighboring parts of the Intermountain area. He currently is the Principal Investigator on research projects totaling approximately $750,000 per annum.

He has been affiliated, since its inception, with the U.S. National Earthquake Hazards Reduction Program—variously as a Principal Investigator of funded research, as a participant in dozens of workshops and conferences, and as a member of peer review panels. He has served on numerous national and state advisory and policy-making committees, including the Committee on Seismology of the National Research Council (1989-1994), the Board of Directors of the Seismological Society of America (1994-1997), the Council of the National Seismic System (1993-present), and the Utah Seismic Safety Commission (1994-present). Since 1977 he has routinely provided professional consulting services on earthquake hazard evaluations for dams, nuclear facilities, and other critical structures and facilities for engineering firms, the International Atomic Energy Agency, the Department of Energy, the Soil Conservation Service, the Bureau of Reclamation, the Electric Power Research Institute, and the State of Utah.

Walter J. Arabasz

SELECTED PUBLICATIONS AND REPORTS SINCE 1990

Arabasz, W. J., editor, 1990, Earthquake instrumentation for Utah, report and recommendations of the Utah Policy Panel on Earthquake Instrumentation, Utah Geological and Mineral Survey Open-File Report 168.

McGuire, R. K., and Arabasz, W. J. 1990, An introduction to probabilistic seismic hazard analysis, *in* Ward, S. H., ed., Geotechnical and environmental geophysics, Vol. 1: Review and tutorial: Society of Exploration Geophysicists, Investigations in Geophysics No. 5, p. 333-353.

Pechmann, J. C., Nava, S. J., and Arabasz, W. J., 1991, Seismological analyses of four recent moderate (M_L 4.8 to 5.4) earthquakes in Utah, Final Report to the Utah Geological Survey, Salt Lake City, Utah, Contract No. 89-3659, 107 p.

Smith, R. B., and Arabasz, W. J., 1991, Seismicity of the Intermountain seismic belt, *in* Slemmons, D. B., Engdahl, E. R., Zoback, M. D., Zoback, M. L., and Blackwell, D., eds., Neotectonics of North America: Geological Society of America, Decade Map Volume 1, p. 185-228.

Arabasz, W. J., Pechmann, J. C., and Brown, E. D., 1992, Observational seismology and the evaluation of earthquake hazards and risk in the Wasatch front area, Utah, *in* Gori, P. L., and Hays, W. W., eds., Assessment of regional earthquake hazards and risk along the Wasatch Front, Utah: U. S. Geological Survey Professional Paper 1500-A-J, p. D1-D36.

Arabasz, W.J., 1992, Earthquake basics for dam safety [extended abs.]: Abstracts and Proceedings, Utah Department of Natural Resources, The State of Utah Dam Safety Workshop, March 19, 1992, Salt Lake City, 9 pp.

Hill, D. P., and others, including W. J. Arabasz, 1993, Remote seismicity triggered by the M 7.5 Landers, California, earthquake of June 28, 1992: Science, v. 260, p. 1617-1623.

Pechmann, J. C., Arabasz, W. J., and Brown, E. D., 1993, Seismotectonics of the 1987-88 Lakeside, Utah, earthquakes: Seismological Research Letters, v. 64, p. 225-238.

Arabasz, W. J., and Hill, S. J., 1994, Aftershock temporal behavior and earthquake clustering in the Utah region [abs.]: Seismological Research Letters, v. 65, p. 32.

Arabasz, W. J., 1994, Fundamentals of the Wasatch Front's earthquake threat: Proceedings, Seminar 1: Economic Impacts of a Large Earthquake, Earthquake Engineering Research Institute Wasatch Front Seismic Risk Regional Seminar; Salt Lake City, Utah, November 1994, p. 1-1 to 1-25.

Arabasz, W. J., 1994, Wasatch Front seismicity and expectable strong ground motion: Proceedings, Seminar 2: Earthquake Research and Mitigation, Earthquake Engineering Research Institute Wasatch Front Seismic Risk Regional Seminar; Salt Lake City, Utah, November 1994, p. 2-1 to 2-40.

Nava, S. J., Arabasz, W. J., and Pechmann, J. C., 1994, The M 5.9 Draney Peak, Idaho (Idaho-Wyoming border) earthquake of February 3, 1994—A preliminary report [abs.]: Seismological Research Letters, v. 65, nos. 3/4, p. 239.

Pechmann, J. C., and Arabasz, W. J., 1995, The problem of the random earthquake in seismic hazard analysis: Wasatch Front region, Utah, *in* Lund, W. R., ed., Environmental and engineering geology of the Wasatch Front region: Utah Geological Association Publication 24, p. 77-93.

Pechmann, J. C., Walter, W. R., Nava, S. J., and Arabasz, W. J., 1995, The February 3, 1995, M_L 5.1 seismic event in the trona mining district of southwestern Wyoming: Seismological Research Letters, v. 66, no. 3, p. 25-34 [minor correction, including revision of magnitude to M_L 5.2, added in v. 66, no. 4, p. 28].

Arabasz, W. J, and Nava, S. J., 1995, Jordanelle Reservoir: Status of test monitoring for reservoir-induced seismicity [abs.]: Seismological Research Letters, v. 66, no. 2, p. 24.

Arabasz, W. J., and Hill, S. J., 1996, Applying Reasenberg's cluster-analysis algorithm to regional earthquake catalogs outside California [abs.]: Seismological Research Letters, v. 67, no. 2, p. 30.

Arabasz, W. J., and Wyss, M., 1996, Significant precursory seismic quiescences in the extensional Wasatch Front region, Utah [abs.]: Eos (Transactions American Geophysical Union), v. 77, no. 46, p. F455.

Arabasz, W. J., Nava, S. J., and Phelps, W. T., 1997, Mining seismicity in the Wasatch Plateau and Book Cliffs coal mining districts, Utah, USA, *in* Gibowicz, S. J., and Lasocki, S., eds., Rockbursts and Seismicity in mines: Rotterdam, A.A. Balkema, p. 111-116.

Arabasz, W. J., 1998, Do regional seismic networks in the U.S. have a future?: Seismological Research Letters, v. 69 no. 6, p. 513-515.

Arabasz. W. J., 1998, Utah's earthquake information needs—New technologies and solutions: Fault Line Forum (published by Utah Geological Survey), v. 14, no. 12, p. 1-4.

Arabasz, W. J., and Pechmann, J. C., 1998, Earthquake data-base issues for seismic hazard analysis in the Utah region [abs.]: Proceedings Volume, Basin and Range Province Seismic-Hazards Summit, Utah Geological Survey Miscellaneous Publication 98-2, p. 31.

Arabasz, W. J., and Nava, S. J., 1999, Historical seismicity and a user's guide to earthquake data in northern Utah, southeastern Idaho, and southwestern Wyoming, *in* Spengler, L. E., ed., Utah Geological Association Publication [in prep.]

PROFESSIONAL CONSULTING

Consulting in Earthquake-Hazard Evaluation and Earthquake Seismology:

1. Rollins, Brown and Gunnell, Inc., Provo, Utah (1977). Site-response analysis for proposed hospital in Logan, Utah.

2. International Atomic Energy Agency, Vienna, Austria (Short-Term Expert, Chile, 1979). Seismotectonic considerations in northern Chile, 21°-27°S, with respect to the siting of a nuclear power plant.

3. Weidlinger Associates, Menlo Park, California (1980). Geological and geophysical information relevant to site-dependent ground motions at Wing V (Wyoming-Nebraska-Colorado).

4. EG&G Idaho, Inc. (Department of Energy), Idaho Falls, Idaho (1980-81). Preparation and presentation of proposal for seismic risk zone revision in southeast Idaho to International Conference of Building Officials.

5. EG&G Idaho Inc. (Department of Energy), Idaho Falls, Idaho (1982). Document review: "Site Investigation at Idaho National Engineering Laboratory, LMFBR Large Developmental Plant (LDP), Conceptual Design Study—Phase III."

6. Lindvall, Richter and Associates, Los Angeles, California (1981-82). Seismic safety investigation of eight Soil Conservation Service dams in southwestern Utah.

7. U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado (1982-83). Review and analysis of geologic, seismotectonic, and design data for the proposed Jordanelle Dam, Bonneville Unit, Central Utah Project, Utah. (Consultant review by W.J. Arabasz, R. H. Jahns, and R.B. Peck.)

8. EG&G Idaho, Inc. (Department of Energy), Idaho Falls, Idaho (1983). Member, Geotechnical Advisory Panel to assist EG&G Idaho, Inc. and D.O.E. regarding programmatic efforts toward site characterization of the Idaho National Engineering Laboratory for the proposed siting of a NEW Production Reactor Facility.

9. Electric Power Research Institute, Palo Alto, California (1984). Participant, "Data Needs Workshop; regarding data management plan and tectonic evaluation for earthquake hazards in the eastern U.S.; participant in and editor of "Proceedings of a Seminar on Defining Tectonic Mechanisms Causing Earthquakes in the Eastern United States."

10. Dames & Moore, Golden, Colorado/Electric Power Research Institute (EPRI), Palo Alto, California (1984-85). Member of "Seismic Hazard Methodology Team," EPRI Seismic Hazards Research Program, for evaluation of earthquake hazards in the eastern United States for the siting of nuclear generating facilities. (Participation in 7 formal workshops, 2 academic seminars, and 3 series of interactive meetings with 6 teams of tectonic evaluation contractors in the central and eastern U.S.).

11. Electric Power Research Institute, Palo Alto, California (1985-87). Participation in scientific review, technical description, and comparative evaluation of EPRI seismic hazard methodology for the central and eastern United States.

12. U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado (1986-87). Review and analysis of geologic, seismotectonic, and design data for the proposed Jordanelle Dam, Bonneville Unit, Central Utah Project. (Consultant review by R. B. Peck, W. J. Arabasz, G. S. Tarbox, and D. D. Campbell.)

13. U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado (1988). Review and evaluation of seismotectonic conclusions and details of final embankment dam design for Jordanelle Dam, Bonneville Unit, Central Utah Project. (Consultant review by R.B. Peck, W.J. Arabasz, and T.G. McCusker.)

14. Dames & Moore, Los Angeles, California (1989). Member of advisory panel for project on seismic code decisions under risk, sponsored by the National Science Foundation.

15. Lawrence Livermore National Laboratory, Livermore, California (1990-91). Member of Seismicity and Tectonic Expert Group, New Production Reactors Project, Idaho National Engineering Laboratory Site.

16. U.S. Bureau of Reclamation—Engineering and Research Center, Denver, Colorado, and Regional Office, Salt Lake City, Utah (1990-92). Review and evaluation of foundation conditions, ongoing geologic mapping procedures, and seismic-safety aspects of the Jordanelle Dam, Bonneville Unit, Central Utah Project. (Consultant review by W.J. Arabasz, R.B. Peck, and D.D. Campbell.)

17. Science Applications International Corporation, Las Vegas, Nevada (1991). Member of Peer Review Group for *Early Site Suitability Evaluation of the Potential Repository Site at Yucca Mountain, Nevada.*

18. Geomatrix Consultants, San Francisco, California (1991-92). Member of expert panel, Electric Power Research Institute-High Level Waste (EPRI-HLW) project to assess earthquake and tectonic issues for the proposed high-level nuclear waste repository at Yucca Mountain, Nevada.

19. Risk Engineering, Inc., Golden, Colorado (1992-94). Investigator for Seismology as part of a *Seismic Hazard Study for Systematic Evaluation Program, Rocky Flats Plant,* conducted for EG&G Rocky Flats, Inc. and sponsored by the U.S. Department of Energy.

20. Woodward-Clyde Federal Consultants, Las Vegas, Nevada (1993-94). Technical reviewer for (1) *Topical Report: Methodology to Assess Seismic Hazards at Yucca Mountain* and (2) *Seismic Design Inputs for the Exploratory Studies Facility at Yucca Mountain.*

21. U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado (1994). Review of design, construction, and operation of Jordanelle Dam and Reservoir, Bonneville Unit, Central Utah Project, Utah. (Consultant review by W.J. Arabasz, D.D. Campbell, and R.B. Peck.)

22. Jack R. Benjamin & Associates, Inc., Mountain View, California (1994). Technical reviewer for *Probabilistic Seismic Hazard Assessment for the U.S. Army Chemical Demilitarization Facility, Tooele, Utah.*

23. TRW Environmental Safety Systems, Inc., Vienna, Virginia (1995). Member of expert team for seismic source characterization for a probabilistic seismic hazard assessment of a high-level nuclear waste repository at Yucca Mountain, Nevada.

24. Rutherford & Chekene, San Francisco, California (1995). Technical review and consulting advice on seismicity and ground-motion considerations for design of a manufacturing plant at Lehi, Utah, for Micron Technology, Inc.

25. TRW Environmental Safety Systems, Inc., Vienna, Virginia (1995). Organizer and chair of plenary session of FOCUS'95—Methods of Seismic Hazard Evaluation (a topical meeting co-sponsored by the American Nuclear Society and the Geological Society of America, September 18-20, 1995, Las Vegas, Nevada).

26. William Lettis & Associates, Inc., Walnut Creek, California (1995). Technical review and consulting advice on seismic source characterization for the stability evaluation of Lake Almanor and Butt Valley Dams, California.

27. Parsons Brinckerhoff, Salt Lake City, Utah (1995-96). Member of Seismic Advisory Committee to Utah Department of Transportation for seismic hazard analysis of the I-15 interstate highway corridor (consulting undertaken under a University of Utah contract).

28. TRW Environmental Safety Systems, Inc., Vienna, Virginia (1996-98). Member of expert team for seismic source characterization for a probabilistic seismic hazard assessment of a high-level nuclear waste repository at Yucca Mountain, Nevada.

29. Utah Department of Environmental Quality (1998-present). Seismicity and earthquake expert for evaluation of a proposed high-level radioactive waste storage facility in Skull Valley, Tooele County, Utah (consulting undertaken under a University of Utah contract).

30. Los Alamos National Laboratory, Los Alamos, New Mexico (1999). Member of Laboratory Seismic Review Committee, Nuclear Materials and Stockpile Management Program, an advisory group on the Laboratory's seismic risks and hazards and related technical and operational activities (consulting contract pending).

RESEARCH FUNDING—LAST FIVE YEARS

1994-95

Seismic network operations along the Wasatch Front urban corridor and adjacent Intermountain seismic belt (FY95): $209,000, U. S. Geological Survey, 1/1/95-12/31/95, lead PI.

Seismicity, ground motion, and crustal deformation— Wasatch Front, Utah, and adjacent Intermountain seismic belt (FY95): $120,000, U. S. Geological Survey, 1/1/95-12/31/95, Co-PI.

Cooperative agreement for seismic event monitoring and analysis, Jordanelle Damsite, Bonneville Unit, Central Utah Project: $54,247, U. S. Bureau of Reclamation, 10/1/94-9/30/95, PI.

Calibration of size and correlation of coal-mining-related seismicity with extraction rates, Wasatch Plateau and Book-Cliffs mining districts: $6,206, University of Utah Mineral Leasing Funds, 7/1/94-5/31/95, PI.

M_W 5.9 Draney Peak, Idaho, earthquake evaluation: $35,140, Idaho National Engineering Laboratory, 8/31/94-12/31/95, Co-PI.

Development of rapid earthquake response: $10,000, unrestricted grant from the Union Pacific Foundation, 2/24/95-2/23/96, PI.

Seismograph Stations: $340,400, State of Utah, 7/1/94-6/30/95, Director.

1995-96

Seismic network operations along the Wasatch Front urban corridor and adjacent Intermountain seismic belt (FY96): $200,000, U. S. Geological Survey, 1/1/96-12/31/96, lead PI.

Seismicity, ground motion, and crustal deformation— Wasatch Front, Utah, and adjacent Intermountain seismic belt (FY96): $100,000, U. S. Geological Survey, 5/1/96-4/30/97, Co-PI.

Cooperative agreement for seismic event monitoring and analysis, Jordanelle Damsite, Bonneville Unit, Central Utah Project: $47,000, U. S. Bureau of Reclamation, 10/1/95-9/30/96, PI.

Collaborative work with coal mine operators for further study of mining-related seismicity, Wasatch Plateau and Book-Cliffs mining districts: $6,200, University of Utah Mineral Leasing Funds, 7/1/95-6/30/96, PI.

M_W 5.9 Draney Peak, Idaho, earthquake evaluation: $35,140, Idaho National Engineering Laboratory, 8/31/94-12/27/96, Co-PI.

Development of rapid earthquake response: $10,000, unrestricted grant from the Union Pacific Foundation, 2/24/96-2/23/97, PI.

I-15 Corridor Seismic Advisory Committee: $1,972, Parsons Brinckerhoff (for Utah Department of Transportation), 12/1/95-8/31/96, PI.

Seismograph Stations: $350,500, State of Utah, 7/1/95-6/30/96, Director.

1996-97

Seismic network operations along the Wasatch Front urban corridor and adjacent Intermountain seismic belt (FY97): $275,000, U. S. Geological Survey, 1/1/97-12/31/97, lead PI.

Studies of earthquake processes to assess time-varying hazard and risk—Wasatch Front, Utah, and adjacent Intermountain Seismic Belt: $100,000, U. S. Geol. Surv., 5/1/97-4/30/98, Co-PI.

Cooperative agreement for seismic event monitoring and analysis, Jordanelle Damsite, Bonneville Unit, Central Utah Project: $47,000, U. S. Bureau of Reclamation, 10/1/96-9/30/97, PI.

Continued studies of coal-mining-related seismicity, Wasatch Plateau and Book-Cliffs mining districts: $5,915, University of Utah Mineral Leasing Funds, 7/1/96-6/30/97, PI.

Development of rapid earthquake response: $10,000, unrestricted grant from the Union Pacific Foundation, 2/24/97-2/23/98, PI.

Seismograph Stations: $361,900, State of Utah, 7/1/96-6/30/97, Director.

1997-98

Seismic network operations along the Wasatch Front urban corridor and adjacent Intermountain seismic belt (FY98): $274,538, U. S. Geological Survey, 1/1/98-12/31/98, lead PI.

Studies of earthquake processes to assess time-varying hazard and risk—Wasatch Front, Utah, and adjacent Intermountain Seismic Belt: $100,000, U. S. Geol. Surv., 5/1/97-10/31/98, Co-PI.

Cooperative agreement for seismic event monitoring and analysis, Jordanelle Damsite, Bonneville Unit, Central Utah Project: $49,750, U. S. Bureau of Reclamation, 10/1/97-9/30/98, PI.

M_W 5.9 Draney Peak, Idaho, earthquake evaluation: $25,206, Idaho National Engineering Laboratory, 6/18/97-6/30/98, Co-PI.

Development of rapid earthquake response: $10,000, unrestricted grant from the Union Pacific Foundation, 2/24/97-2/23/98, PI.

Seismic characterization of coal-mining seismicity in Utah for CTBT monitoring: $58,960, Lawrence Livermore National Laboratory, 2/28/98-2/28/99, lead PI.

Seismograph Stations: $370,500, State of Utah, 7/1/97-6/30/98, Director.

1998-99

Seismic network operations along the Wasatch Front urban corridor and adjacent Intermountain seismic belt (FY99): $248,739, U. S. Geological Survey, 1/1/99-12/31/99, lead PI.

Cooperative agreement for seismic event monitoring and analysis, Jordanelle Damsite, Bonneville Unit, Central Utah Project: $50,000, U. S. Bureau of Reclamation, 10/1/98-9/30/99, PI.

Seismic characterization of coal-mining seismicity in Utah for CTBT monitoring: $58,960, Lawrence Livermore National Laboratory, 2/28/98-2/28/99, lead PI.

Development of rapid earthquake response: $10,000, unrestricted grant from the Union Pacific Foundation, 2/24/98-2/23/99, PI [renewal award for 1999-2000 pending].

Studies of earthquake processes to assess time-varying hazard and risk—Wasatch Front, Utah, and adjacent Intermountain Seismic Belt: $100,000, U. S. Geological Survey, 5/1/97-10/31/98, Co-PI.

Seismograph Stations: $381,200, State of Utah, 7/1/98-6/30/99, Director.

SCHOLARLY JOURNAL REVIEW, PROPOSAL REVIEW, AND EDITORIAL SERVICE†

1975-1980s	Reviewer for Geological Society of America, GSA *Bulletin* and *Geology*
1976-1990	Reviewer for the *Bulletin of the Seismological Society of America*
1977-1980s	Reviewer of proposals for National Science Foundation, Geophysics Division
1978-1980s	Reviewer for *Journal of Geophysical Research*
1980-1982	Reviewer of proposals for National Science Foundation, Polar Earth Science Program
1981-1982, 1985-1996	Reviewer of proposals to U.S. Geological Survey Earthquake Hazards Reduction Program
1983-1985	Reviewer of proposals to National Science Foundation, Crustal Structure and Tectonics Program
1985	Reviewer for U.S. Geological Survey, manuscripts submitted to *Open-File Report* series
1985-1988	Associate Editor, *Bulletin of the Seismological Society of America*
1986	Reviewer for *Tectonophysics*
1988	Reviewer for *PAGEOPH*, special issue on seismicity in mines
1992-1997	Reviewer of proposals for National Science Foundation, Geophysics Division
1995-present	Reviewer for *Earthquake Engineering Research Institute Monograph Series*
1995-96	Reviewer for *Earthquake Spectra*
1996	Reviewer for the *Bulletin of the Seismological Society of America*
1997	Reviewer for University of Utah Research Committee
1998	[See entry above under "**-present**"]

†Exclusive of technical peer-review performed on a consulting basis (see Professional Consulting)

EXHIBIT 2

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	Docket No. 72-22-ISFSI
PRIVATE FUEL STORAGE, LLC (Independent Spent Fuel Storage Installation)	)	ASLBP No. 97-732-02-ISFSI
	)	January 26, 2000

DECLARATION OF DR. MARVIN RESNIKOFF IN SUPPORT OF STATE OF UTAH'S REQUEST FOR ADMISSION OF LATE-FILED MODIFICATION TO BASIS 2 OF UTAH CONTENTION L

I, Dr. Marvin Resnikoff, declare under penalty of perjury that:

1. I am the Senior Associate at Radioactive Waste Management Associates, a private consulting firm based in New York City. A statement of my qualifications has been filed previously in this proceeding. *See e.g.*, Exhibit 2 to State of Utah Contentions filed November 23, 1997. I am an expert in the field of radioactive waste management, including spent nuclear power plant fuel storage.

2. I am familiar with Private Fuel Storage's ("PFS's") license application and Safety Analysis Report in this proceeding, as well as the applications for the storage and transportation casks PFS plans to use. I am also familiar with NRC regulations, guidance documents, and environmental studies relating to the transportation, storage, and disposal of spent nuclear power plant fuel, and with NRC decommissioning requirements.

3. I assisted in the preparation, in part, of State of Utah's Request for Admission of Late-Filed Modification to Basis 2 of Utah Contention L, filed on January 26, 2000 ("Modification to Basis 2")

4. As stated in Modification to Basis 2, a loaded HI-TRAC overpack is not designed to withstand a 30-foot drop. The HI-TRAC transfer cask is designed to withstand a drop from a horizontal lift height of 42 inches.[1] This is at least in part because the HI-TRAC overpack does not have impact limiters. For this reason, PFS has

[1] Table 2.2.8, HI-STORM TSAR, Holtec.

not provided a reasonable assurance that NRC dose limits would not be exceeded in an accident involving the drop of a loaded HI-TRAC overpack. PFS is relying on the single failure-proof crane to prevent a drop of the HI-TRAC, but safety cannot be assured if the crane fails in a 2,000-year return earthquake.

5. There are other reasons why the PFS facility may exceed NRC dose limits. For example, PFS's accident evaluation does not bound the design basis accident, because the accidents considered by PFS are not design basis accident DE IV under ANSI/ANS-57.9-1999.

6. Furthermore, the assumed accident leak rate is too small and the assumed breach hole in the canister considered by PFS is too small. This leakage rate is consistent with Table 4-1, NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," that is based on another NRC document, NUREG/CR-6487, "Containment Analysis for Type B Packages Used to Transport Various Contents."[2]

7. The leakage rate and calculation methodology in NUREG/CR-6487 are based on ANSI standard N14.5 for transportation casks.[3] But the assumed leakage rate is not conservative because it is based on testing requirements that will not be met for storage casks. ANSI standard N14.5[4] assumes that casks will be leak-tested periodically, before shipment and after maintenance and repair. But some ISFSI's, such as the PFS facility, have no provisions for testing helium leakage during storage and no provisions for repairing and maintaining casks and testing for leakage after repair and maintenance. Thus, these ISFSI's cannot satisfy the leak testing requirements of N14.5, and NUREG-1617 does not provide a conservative basis for detecting leakage rates.

8. Further, the methodology employed in NUREG/CR-6487 may not apply for certain accidents that exceed the design basis accident. NUREG/CR-6487 calculates the leak hole diameter that corresponds to a regulatory-allowable release rate under accident conditions. This leak hole size can easily be exceeded in accidents involving sabotage. Impact with a MILAN or TOW-2 hand held anti-tank device can produce a leak hole

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[2] Anderson, BL et al, "Containment Analysis for Type B Packages Used to Transport Various Contents," Lawrence Livermore National Laboratory, NUREG/CR-6487, November 1996.

[3] NUREG/CR-6487, p. 1.

[4] American National Standards Institute, ANSI N14.5, "Leakage Tests on Packages for Shipment," Table 1.

larger than calculated in NUREG/CR-6487. Impact with a jet engine or a hanging bomb at 600mph can also produce leak holes larger than estimated in NUREG/CR-6487.

9. If Modification to Basis 2 is admitted, I am prepared to provide expert testimony regarding these matters. I expect that my testimony would follow the general outline of the statements in paragraphs 4 through 6 above. In addition, I would provide additional detail regarding the PFS facility design based on information gathered in discovery, as well as additional detail regarding my analysis of the size of the breach hole considered by PFS in its accident analysis.

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Dr. Marvin Resnikoff

January 26, 2000

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/s/ Marvin Resnikoff

January 26, 2000