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OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

January 5, 2000

Secretary of the Commission
U. S. Nuclear Regulatory Commission
11555 Rockville Pike, One White Flint North
Rockville, MD 20852-2738
Attn: Docketing & Services Branch

Re: Private Fuel Storage – Docket No. 72-22 – ASLBP No. 97-732-02

To the Secretary of the Commission:

Enclosed please find (1) the original Affidavit of Dr. Alan Soler filed in conjunction with "Applicant's Objections and Responses to State of Utah's Fifth Set of Discovery Requests," dated the December 13, 1999, (2) the original Affidavit of Paul Trudeau filed in conjunction with "Applicant's Objections and Responses to State of Utah's Fifth Set of Discovery Requests," dated the December 13, 1999, (3) the original Affidavit of Dr. Alan Soler filed in conjunction with "Applicant's Response to State of Utah's Motion to Compel Applicant to Respond to State's Fifth Set of Discovery Requests," dated December 27, 1999, and (4) the original Affidavit of Dr. Alan Soler filed in conjunction with "Applicant's Motion for Summary Disposition of Utah Contention GG – Utah Contention GG – Failure to Demonstrate Cask-Pad Stability During Seismic Event for TranStor Casks," dated December 30, 1999. The signature pages of the affidavits filed with these documents were facsimile copies.

Please call me at 202-663-8304 if you have any questions.

Sincerely,

Paul Gaukler

Paul A. Gaukler

cc: (Without enclosure) G. Paul Bollwerk III, Esq.
Dr. Jerry R. Kline
Dr. Peter S. Lam
Adjudicatory File, Atomic Safety and Licensing Board Panel

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Sherwin Turk, Esq.
Denise Chancellor, Esq.
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Danny Quintana, Esq.

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
	)	
(Private Fuel Storage Facility)	)	ASLBP No. 97-732-02-ISFSI

DECLARATION OF DR. ALAN SOLER

Dr. Alan Soler states as follows under penalties of perjury:

1. I am an Executive Vice-President with Holtec International. In this position, I am responsible for the development of analytical methods to evaluate cask designs.

2. I am duly authorized to verify Applicant's Response to State's Fifth Requests for Discovery; specifically, Request for Admission No. 18 and Interrogatory No. 1.

3. I certify that the statements and opinions in such responses are true and correct to the best of my personal knowledge and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 13, 1999.

Dr. Alan Soler

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
	)	
(Private Fuel Storage Facility)	)	ASLBP No. 97-732-02-ISFSI

DECLARATION OF PAUL TRUDEAU

Paul Trudeau states as follows under penalties of perjury:

1. I am the Lead Geotechnical Engineer with Stone & Webster Engineering Corporation (Stone & Webster) for the Private Fuel Storage Facility ("PFSF") project.

2. I am duly authorized to verify Applicant's Response to State's Fifth Requests for Discovery; specifically, Request for Admission No. 16 and Interrogatory No. 1.

3. I certify that the statements and opinions in such responses are true and correct to the best of my personal knowledge and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 13, 1999.

Paul Trudeau

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
	)	
(Private Fuel Storage Facility)	)	ASLBP No. 97-732-02-ISFSI

DECLARATION OF DR. ALAN SOLER

Dr. Alan Soler states as follows under penalties of perjury:

1. I am an Executive Vice-President with Holtec International ("Holtec"). Holtec is a vendor of storage casks for the Private Fuel Storage Facility ("PFSF"). My professional and educational experience is summarized in the resume attached as Exhibit 1 to this declaration.

2. In my capacity as Executive Vice-President for Holtec, I oversaw and am responsible for the revised analysis of the cask stability of the TranStor cask during the design basis seismic event entitled, "PFSF Site-Specific Cask Stability Analysis for the TranStor Storage Casks," HI-992295. This analysis was submitted to the NRC on September 23, 1999, and transmitted to the State on September 30, 1999. I am also familiar with Utah Contention GG raised by the State of Utah in the NRC licensing hearing for the PFSF.

3. Prior to my current employment with Holtec International, I was a Professor of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania. As an Assistant, Associate, and full Professor over a 26 year period, I taught graduate and undergraduate courses in mechanical engineering, engaged in funded research, and was an active consultant to industry on various mechanical engineering

matters. In several of my consulting matters, I conducted experiments to determine the coefficient of friction between two contacting surfaces.

4. I have reviewed Contention Utah GG as well as the State's basis underlying the contention. In Utah GG, the State claims that PFS "used a non-conservative 'nonsliding cask' tipover analysis that did not consider that the coefficient of friction may vary over the surface of the pad, and did not consider the shift from the static case to the kinetic case when considering momentum of the moving casks."

5. In the basis for the contention, the State similarly claims that a "factor not considered by . . . Advent Engineering Services, Inc., who evaluated the tipover analysis using the horizontal seismic forces, is that the coefficient of friction may vary over the surface of the pad. . . . . However, the coefficient of friction, which is larger when the casks are static, may also reduce under dynamic conditions of an earthquake. Advent Engineering did not consider the shift from the static case to the kinetic case when considering the momentum of the moving casks." State of Utah's Request for Consideration of Late-Filed Contention GG, at 7-8 (footnote omitted).

6. Based on the language of the Contention and its stated basis, the subject of Utah GG is the value of the coefficient of friction used, or not used, in the analysis, including the potential shift from a static value for the coefficient of friction to a dynamic value. Specifically, contention Utah GG was made with respect to the initial cask stability analysis performed for the TranStor cask by Advent Engineering. The analysis by Advent assumed that the cask was analytically pinned at one edge and therefore the coefficient of friction between steel and concrete was not considered. This approach conservatively favors the tendency of a cask to tipover because all of the applied force acts to tipover the cask and no force is expended to overcome the frictional force. Because the coefficient of friction was not considered in this analysis, variations in the coefficient of friction and the shift in the coefficient of friction from the static case to the kinetic case, i.e., sliding, were not relevant. Utah GG challenges the adequacy of the "nonsliding cask" tipover analysis performed by Advent. (As I will explain in a

subsequent declaration in support of a Motion for Summary Disposition of Utah GG, the revised Holtec cask stability analysis for the TranStor cask contained in HI-992295 addresses the coefficient of friction issues raised in Utah GG.)

7. I have reviewed Requests for Admissions Nos. 10, 11, 12, 19 and 20(b) contained in the State's Fifth Set of Discovery Requests directed to the Applicant, dated December 1, 1999. I have also reviewed the technical arguments in the State of Utah's Motion to Compel Applicant to Respond to State's Fifth Set of Discovery Requests, dated December 20, 1999 made in support of the State's motion to compel answers with respect to Requests for Admissions Nos. 10, 11, 12, 19 and 20(b). These requests do not address or seek information concerning the value of the coefficient of friction that should be used in the cask stability analysis for the TranStor cask, the subject of Utah GG.

8. The State in its motion claims that flexible behavior of the pad will affect the "friction" between the cask and the pad and that lift off between the pad and the cask will affect the application of "friction" on the pad. The State's use of the term "friction" in both contexts confuses the concepts of "coefficient of friction" and "friction force."

9. The "coefficient of friction" is a property associated with a contact point between two surfaces. The value of the coefficient of friction is dependent on the characteristics of the two materials at the interface contact point and also whether the materials are in motion, relative to each other, along a direction parallel to the interface surface. The coefficient of friction between two materials at rest at the interface contact point, i.e. the static case, may be slightly more than for the same materials in relative motion, i.e., the kinetic case. The coefficient of friction shifts from the static case to the kinetic case upon the initiation of relative movement. The value of the coefficient of friction is not influenced by the magnitude of the contact pressure at the interface contact point. Thus, the value of the "coefficient of friction" – which is the subject of Utah GG – will not be influenced by flexible behavior of the pad and any lift off between the pad and cask.

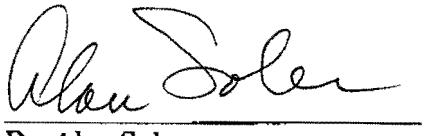
10. The coefficient of friction is independent of the friction force. The local compressive pressure at any point on the interface between two contacting surfaces multiplied by the coefficient of friction gives a lateral shear resistance at the local point. The friction force is the integrated value of this shear resistance over the area of contact of the two surfaces at any instant in time. Thus, the "friction force" can be influenced by flexible behavior of the pad and any lift off between the pad and cask, but is not the subject of Utah GG.

11. The State also claims that any lift off between the pad and the cask or flexible nature of the pad will affect the shift from the static case to the kinetic case. Again, the friction force would be affected, but neither the values of the coefficient of friction for the static and kinetic cases, nor the change in value from the static coefficient of friction to the kinetic coefficient of friction would be affected by any lift off between the pad and the cask or flexible nature of the pad.

12. The State also claims, with respect to Request for Admission No. 20, that over time cold bonding between the cask and the pad could occur which "may directly and significantly impact the transition from the static to the kinetic case." However, if a cask truly cold-bonded to the pad, it could not move and there would be no transition from the static to the kinetic case. Moreover, cold bonding would increase the stability of the storage cask, not decrease it.

I declare under penalty and perjury that the foregoing is true and correct.

Executed on December 24, 1999.



Dr. Alan Soler

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety And Licensing Board

In the Matter of	)	
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PRIVATE FUEL STORAGE L.L.C.	)	Docket No. 72-22
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DECLARATION OF DR. ALAN SOLER

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1. I am an Executive Vice-President with Holtec International ("Holtec"). Holtec is a vendor of storage casks for the Private Fuel Storage Facility ("PFSF"). My professional and educational experience is summarized in the resume attached as Exhibit 1 of this declaration.

2. In my capacity as Executive Vice-President for Holtec, I oversaw and am responsible for the revised analysis of the cask stability of the TranStor cask during the design basis seismic event entitled, "PFSF Site-Specific Cask Stability Analysis for the TranStor Storage Casks," HI-992295. (Exhibit 2 to this Declaration.) This analysis was submitted to the NRC on September 23, 1999, and transmitted to the State on September 30, 1999. I am also familiar with Utah Contention GG raised by the State of Utah in the NRC licensing hearing for the PFSF.

3. Prior to my current employment with Holtec International, I was a Professor of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania. As an Assistant, Associate, and full Professor over a 26 year period, I taught graduate and undergraduate courses in mechanical engineering, engaged in funded research, and was an active consultant to industry on various mechanical engineering matters.

4. In the initial License Application for the PFSF, dated June 20, 1997, PFS concluded that the TranStor cask would remain stable during the site specific deterministic design earthquake. PFS based this conclusion on the analysis performed by Advent Engineering Services, Inc. The analysis by Advent assumed that the cask was analytically pinned at one edge and therefore the coefficient of friction between steel and concrete was not considered.

5. I have reviewed Contention Utah GG as well as the State's basis underlying the contention. In Utah GG, the State claims that PFS "used a non-conservative 'nonsliding cask' tipover analysis that did not consider that the coefficient of friction may vary over the surface of the pad, and did not consider the shift from the static case to the kinetic case when considering momentum of the moving casks." In the basis for the contention, the State similarly claims that a "factor not considered by . . . Advent Engineering Services, Inc., who evaluated the tipover analysis using the horizontal seismic forces, is that the coefficient of friction may vary over the surface of the pad. . . . However, the coefficient of friction, which is larger when the casks are static, may also reduce under dynamic conditions of an earthquake. Advent Engineering did not consider the shift from the static case to the kinetic case when considering the momentum of the moving casks." State of Utah's Request for Consideration of Late-Filed Contention GG, at 7-8 (footnote omitted).

6. Based on the language of the Contention and its stated basis, the subject of Utah GG is the value of the coefficient of friction used, or not used, in the analysis, including the potential shift from a static value for the coefficient of friction to a dynamic value. Specifically, contention Utah GG was made with respect to the initial cask stability analysis performed for the TranStor cask by Advent Engineering. Advent's approach conservatively favors the tendency of a cask to tipover because all of the applied force acts to tipover the cask and no force is expended to overcome the frictional force. Because the coefficient of friction was not considered in this analysis, variations in the coefficient of friction and the shift in the coefficient of friction from the static case to

the kinetic case, i.e., sliding, were not relevant. Utah GG challenges the adequacy of the "nonsliding cask" tipover analysis performed by Advent. The revised analysis contained in the "PFSF Site-Specific Cask Stability Analysis for the TranStor Storage Casks," HI-992295, addresses these coefficient of friction issues raised in Utah GG.

7. The "coefficient of friction" is a measure of the intensity of the resistance to movement of contacting surfaces. The value of the coefficient of friction is dependent on the characteristics of the two materials at the interface contact point and also whether the materials are in motion, relative to each other, along a direction parallel to the interface surface. The coefficient of friction between two materials at rest at the interface contact point, i.e. the static case, may be slightly more than for the same materials in relative motion, i.e., the kinetic case. The coefficient of friction shifts from the static case to the kinetic case upon the initiation of relative movement.

8. To analyze the stability of the Transtor storage cask, Holtec employed the same methodology used in the analysis of the Hi-Storm 100 storage cask submitted as part of PFS's initial license application filed on June 20, 1997, and used in two subsequent cask stability analysis, the "Seismic Response of Casks at the PFS ISFSI from 1000 Year Return Seismic Event," HI-992242, Rev.1 (August 1999) and the "Seismic Response of Casks at the PFS ISFSI from 2000 Year Seismic Event," HI-992277 (August 1999). Under the analytical model, the storage cask is free to slide and impact other casks, as well as to tipover.

9. In its analysis of the TranStor storage cask, Holtec evaluated the potential for cask tipover and cask-to-cask impact for the design basis seismic event by analyzing cask stability at two coefficients of friction. The analysis at the lower coefficient of friction of 0.2 emphasizes the potential of the cask sliding on the concrete pad, and would account for any momentum effects should an impact occur. The analysis at the higher coefficient of friction of 0.8 emphasizes the possibility of cask tipover.

10. The chosen values of 0.2 and 0.8 effectively bracket the expected range of the coefficient of friction for the interaction of a steel-bottomed cask with a concrete pad. Typical upper and lower bounds for the static coefficient of friction given by various handbooks for metal on concrete/stone surfaces range between 0.3 to 0.7. See, e.g., Mark's Standard Handbook for Mechanical Engineers 3-22 (Eugene A. Avallone & Theodore Baumeister, III, eds., 10th ed. 1997) (coefficient of friction for iron on stone – 0.3 to 0.7); Harry Parker and James Ambrose, Simplified Mechanics and Strength of Materials 34 (5th ed. 1992) (coefficient of friction for metal on stone, masonry, or concrete – 0.3 to 0.7). Kent's Mechanical Engineering Handbook 7-28 (C. Carmichael, ed., 12th ed. 1965) (coefficient of friction for steel on stone – 0.420 to 0.491). The value for the kinetic coefficient of friction will be slightly less than these values. The value of the lower coefficient of friction analyzed by Holtec of 0.2 is less than the lower bounds from these handbooks. The value of the higher coefficient of friction analyzed by Holtec of 0.8 is greater than the upper bounds from these handbooks.

11. Because a cask has a greater potential to slide as the coefficient of friction is decreased, the analysis of the cask stability at the lower coefficient of friction is more likely to result in sliding. Correspondingly, as the coefficient of friction is increased, a storage cask becomes more likely to tipover instead of sliding. By analyzing high and low coefficients of friction, Holtec's analysis ensures that the potential effects of both cask tipover and sliding are evaluated.

12. Holtec's analysis of the stability of the TranStor casks resolves the issues contested by the State in Utah GG. First, the analysis addresses the State's concern with the "'nonsliding cask' tipover analysis" by allowing the casks to slide. Because no restraints are placed on the movement of the casks, the analysis evaluates the potential for both sliding and tipover. Second, by analyzing two coefficients of friction that bracket reasonably expected values, the revised analysis considers the effect of the coefficient of friction varying over the surface of the pad. Any variation in the coefficient of friction will be within the range analyzed, and any sliding or tipping will be less than that

determined by Holtec. Third, the effect of the reduction of the coefficient of friction due to the "shift from the static case to the kinetic case" is considered by the analysis of cask stability at the lower coefficient of friction. Because the lower coefficient of friction of 0.2 is less than any reduction of the coefficient of friction due to the dynamic conditions of an earthquake, the revised analysis of the TranStor cask conservatively estimates the effects of sliding for the kinetic case.

I declare under penalty and perjury that the foregoing is true and correct.

Executed on December 30, 1999.

Dr. Alan Soler