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UNITED	STATES OF AMERICA	ADJUDICATIONS STA
NUCLEAR R	EGULATORY COMMISSIC	N
Before the Atomic	Safety and Licensi	ng Board
_	) De elect No. 70.00	
In the Matter of	) ASLPB No. 97-732	-02-ISFSI
PRIVATE FUEL STORAGE L.L.C.	) ) TELEPHONE DEPOSI )	TION OF:
(Private Fuel Storage Facility)	) KRISHNA P. SINGE ) ALAN I. SOLER	and
	) _) (Utah Contention	n L, Part B)
	VOLUME I	
Thursday, Nove	ember 15, 2001 - 2:1	L9 p.m.
Thursday, Nove	ember 15, 2001 - 2:1	General
Thursday, Nove Location: Offi 160 East	ember 15, 2001 - 2:1 ice of the Attorney 300 South, 5th Floo	General
<b>Thursday, Nove</b> Location: Offi 160 East Salt	ember 15, 2001 - 2:1 ice of the Attorney 300 South, 5th Floo Lake City, Utah	General
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## CONDENSED TRANSCRIPT

UNITED STATES OF AMERICA

## NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of ) Docket No. 72-22 ) ASLPB No. 97-732-02-ISFSI PRIVATE FUEL STORAGE ) L.L.C. ) TELEPHONE DEPOSITION OF: (Private Fuel Storage ) KRISHNA P. SINGH and Facility) ) ALAN I. SOLER ) (Utah Contention L, Part B)

## VOLUME II

Friday, November 16, 2001 - 11:26 a.m.

Location: Office of the Attorney General 160 East 300 South, 5th Floor Salt Lake City, Utah

Reporter: Vicky McDaniel Notary Public in and for the State of Utah



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	In the matter of: P	ΓIVè	
	Krishna P. Singh & Alan I. S	Sole	er * November 15, 2001
	SHEET 5 PAGE 33	T	PAGE 35
	33		JJ
1	process, Bob Youngs. So I'd say there was only one		to present you're the lead analyst in mechanical
,	person I talked to.	2	seismic/structural analysis, and I presume that was
rs.	Q. Thank you. And who at Stone and Webster	3	your description in describing your duties?
4	have you had discussions with?	4	A. (DR. SOLER) That's correct.
5	A. (DR. SOLER) Oh, let's see. John Donnell,	5	Q. What does METCON stand for?
6	Jerry Cooper, Stan Macy, Paul Trudeau up in the Boston	6	A. (DR. SOLER) That's just an acronym for
7	office, and a couple of people in the Cherry Hill	7	metal/concrete construction.
8	office, Mr. Ebbeson. I don't believe I've missed	8	Q. And have you conducted site-specific seismic
9	anybody, but there have been so many people over the	9	analyses that estimate the probability of cask failure
10	years. I might have. But those are the ones that come	10	for sites other than PFS?
11	to mind. Oh, and wait a minute. I quess I've had a	11	MR. GAUKLER: Objection. What do you mean
12	conversation with Dr. Wen Tseng having to do with the	12	by cask failure?
13	input that I gave him for the pad analysis.	13	Q. Let me rephrase. Have you conducted
11	O Okay, thank you. Who is your current	14	site-specific cask stability analysis from seismic
15	employer?	15	ground motion for facilities other than the PFS
16	a (DR SOLER) Holter International.	16	facility?
17	A. (DA. Dominy notice inclusioner:	17	A. (DR. SOLER) Yes, I have.
10	2. (ND COLED) Executive vice president and	18	0. For which sites, or for which
10	rise president of angineering	19	A. (DR. SOLER) For Diablo Canvon, some scoping
20	Vice president of engineering.	20	work for Humboldt Bay, some work for Enertoy Northwest.
20	y. And what are your duries.	21	and for let's see. Did we do I believe that we
21	A. (DR. Soler) oversee the entire engineering	22	did some for Dresden and for the Tennessee Valley
22	stall in general, and specifically have direct charge	22	Anthonity
23	or the people doing structural and seismic analysis.	24	0 For the analysis at Diablo Canvon, is this
29	Q. Alla HOW II YOU II TOOK at your resume.	25	for the anchored HI-STORM 100S cask?
23	A. (DR. SOLER) OKAY.	23	Tor the dichored in orong rood cack.
			DACE 36
l	PAGE 34 34		PAGE 36 36
ا بہ	PAGE 34 O If you'll review your resume, take a moment	1	PAGE 36 36 A. (DR. SOLER) Yes, it is.
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123	PAGE 34       34         Q.       If you'll review your resume, take a moment         to review your resume.       Could you tell me if it's         current?       a         a       (DR_SOLER)         Image: Non-Sole and take       a	1 2 3 4	PAGE 36 A. (DR. SOLER) Yes, it is. Q. Do you recall the ground motion at Diablo Canyon? A. (DR. SOLER) In what way?
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•		In the matter of:	Priv	rate Fuel Storage
		Krishna P. Singh & Alan I.	Sol	er * November 15, 2001
	,	PAGE 37 37		PAGE 39 39
Ī	1	A. (DR. SOLER) Over the period September 2000	1	publication?
	2	to essentially September 2001.	2	A. (DR. SOLER) Well, it had nothing to do with
	3	MS. NAKAHARA: Can we get a copy of this	3	dry storage casks. It dealt with heat exchanger
ł	4	analysis?	4	foundations, and the external loads were a combination
	5	MR. GAUKLER: I'll take it under advisement.	5	of piping and seismic loads. But it was dealing with
	6	Q. (BY MS. NAKAHARA) The scoping for Humboldt	6	determining the stresses in the foundation of a heat
1	7	Bay, approximately what period did you do the scoping?	17	exchanger.
	8	A. (DR. SOLER) I can't honestly recall the	8	Q. Would the principles applied to heat
	9	dates without leaving the room, I guess.	9	exchanger foundation be similar to that of a dry cask
	10	Q. That's fine. Was this for a HI-STORM 100	10	storage system?
	11	cask or a 100S cask?	111	A. (DR. SOLER) Not really. The shape was
	12	A. (DR. SOLER) It was not.	12	specific to heat exchangers, for the most part. I
	13	0. The Entergy Northwest, what type of cask	113	mean, if you look at the date, 1985, that was well
	14	system did vou analyze there?	14	before dry storage entered my thinking.
	15	A. (DR. SOLER) That was a 100S.	15	MS. NAKAHARA: I asked for this document
	16	0. And where is the Entergy Northwest facility	16	earlier. Mr. Gaukler. I'd still request that we get a
	17	located?	17	copy of this.
	18	A. (DR. SOLER) Richland, Washington.	18	MR. GAUKLER: Okay.
	19	Q. And what were the zero period accelerations	19	Q. (BY MS. NAKAHARA) And then Dr. Soler, if
12	20	that you looked at in that analysis?	20	you'll look at publication No. 57 on page 7 entitled
12	21	A. (DR. SOLER) Outside the building, I	21	Some Results from Simultaneous Seismic Simulations of
	22	believe I'd just better not say, because I'm	22	All Racks in a Fuel Pool. Will you describe this
12	23	guessing. But it was not as large as what I quoted you	23	publication in general terms?
	1	For Diskle Commen	1	
	7	IOF Diablo canyon.	24	A. (DR. SOLER) That was an analysis of a
72	5	MS. NAKAHARA: We'd like a copy of that	24	A. (DR. SOLER) That was an analysis of a series of spent fuel racks considered immersed in water
F	5	MS. NAKAHARA: We'd like a copy of that PAGE 38	24 25	A. (DR. SOLER) That was an analysis of a series of spent fuel racks considered immersed in water PAGE 40
F	<u>1</u>	MS. NAKAHARA: We'd like a copy of that PAGE 38 38	24 25	A. (DR. SOLER) That was an analysis of a series of spent fuel racks considered immersed in water PAGE 40 40
F	1	MS. NAKAHARA: We'd like a copy of that PAGE 38 analysis also. MB. CAUKLEP: Lill take it under advicement	24 25 1	A. (DR. SOLER) That was an analysis of a series of spent fuel racks considered immersed in water PAGE 40 in a fuel pool and subject to a hypothetical seismic orgitation. It was not creative to any plan
F	1 2 3	MS. NAKAHARA: We'd like a copy of that PAGE 38 analysis also. MR. GAUKLER: I'll take it under advisement. (BY MS. NAKAHARA) and for the Dresden	24 25 1 2 3	A. (DR. SOLER) That was an analysis of a series of spent fuel racks considered immersed in water PAGE 40 40 in a fuel pool and subject to a hypothetical seismic excitation. It was not specific to any plan.
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	1 2 3 4 5 6	MS. NAKAHARA: We'd like a copy of that PAGE 38 analysis also. MR. GAUKLER: I'll take it under advisement. Q. (BY MS. NAKAHARA) And for the Dresden facility, what type of zero period accelerations did you use there? A (DP SOLER) They were very low about 0.2	24 25 1 2 3 4 5 6	A. (DR. SOLER) That was an analysis of a series of spent fuel racks considered immersed in water PAGE 40 in a fuel pool and subject to a hypothetical seismic excitation. It was not specific to any plan. MS. NAKAHARA: Okay. And we'd request this document also. MR. GAUKLER: Okay. O (BY MS. NAKAHARA) and then if you'll look
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CitiCourt, LLC 801.532.3441

		In the matter of: P	riva	te Fuel Storage
		Krishna P. Singh & Alan I. Sole	r, V	ol. II * November 16, 2001
		SHEET 7 PAGE 93		PAGE 95 95
	Į		1	arona did thora andas have any actual test data in
	1	describing your cask stability analysis, you mentioned	1	dielid, uiu cliuse coulds have any accuait cost ducu in
$\bigcirc$	<u>í</u> 2	that you used a lump mass model of the system.	14	Which they were calibrated, to the extent you know:
	3	A. (DR. SOLER) Yes.	3	A. (DR. SOLLER) I would not know one way of the
	4	Q. Have you, for the PFS case or any previous	4	other, although at least in one case where a simple
	5	case in which you used the same model for a HI-STORM	5	code was used as part of a thesis of the meriles of
	6	100 cask, have you calibrated that model with any test	6	believe that there was some testing of the results of
	7	data?	17	that code against an experimental model.
	8	A. (DR. SOLER) Only against classical	8	Q. Do you have any, does holted have any test
	9	solutions. I would not say certain aspects of the	9	data which shows the HI-STORM 100's additing to
	110	model have been calibrated against test data in the wet	10	withstand ground motion?
	lii	storage arena, but in general the program has been	11	A. (DR. SOLER) No.
	112	validated by comparing against other solutions which	12	Q. And is it correct that you also this
	117	have the same characteristics.	13	would encompass any bench scale test data?
	14	0 And do I recall correctly that you compared	14	A. (DR. SOLER) The answer would be still no.
	15	your model solutions to ANSYS, or am I not recalling	15	MS. NAKAHARA: Okay, thank you.
	10	your model solutions to money of an I not could by	16	We've been going probably less than 30
	10	COFFECTLY:	17	minutes, but if you're willing to take a perhaps a
	11	A. (DR. SOLER) I believe at one solge of the	18	longer break, a 30-minute break, I think I can make
	18	development of the algorithm a portion of the model for	19	this go a little faster.
	19	a specific job was compared against a similar model	20	MR. GAUKLER: Okav.
	20	from ANSYS, although the comparison was not made on	21	MS NAKAHARA. Actually, how about if I call
<b>-</b>	21	racks or casks, it was made on a problem that was	22	you back at four o'clock your time? Is that convenient
	22	developed simply for the purposes of making the	22	for you Mr. O'Neill?
2	23	comparison.	23	MP O'NFILL. That's fine
-	24	Q. To the extent you recall, what other models	24	MC NAKANADA. Thank you I suspect I have
-	25	were compared to the lump mass model used in the PPS	25	PLOT WARMANDER. THEMA YOU. I DEEPEED I HELE
	1	PAGE 94 Q4		PAGE 96 96
		) ' D	1	less than an hour of questions.
		analysis:	15	MR. O'NEILL: Dr. Soler, or all together?
	2	MR. GAUKLER: ODJECTION, Vague and ambiguous	1 2	MS NAKAHARA: All together.
	3	question.	Ĩ	(Lunch recess from 1:27 to 2:06 p.m.)
	4	Q. Dr. Soler, do you understand the question:		(BUNCH TEEEDS TICK THE TEE TECONVENING THE
	5	You indicated that you compared other models to the		denosition of Dr. Alan Soler and Dr. Krishna Singh, and
	6	lump mass model you referred to earlier in the Pro Cask	1 7	Dr. Singh has now joined us. Is that correct?
	17	stability analysis.		DI. Singh has now joined us. is ende correct. This is Chris
	8	A. (DR. SOLER) No, no. What I stated was that		A. (DR. DENGLY THE DE COLLECCE, CHED DE CHED
	9	the entire, the computer codes that we used for PPS has	10	MC NAKAHADA · And I think Paul. Mr. Gaukler
	10	been used previously in dry storage submittals in the		wanted to go on the record attributing a paragraph in
	11	recent past, and in the near and distant past it's been		Malled LU yo on the record accuracing a paragraph in the dealeration to Mr. Gingh and I'll lat Daul do
i <b>الار</b>	12	used in wet storage applications. And in the course of	12	the decidiation to mi. Singh, and i if fet taut do
	13	applications before the NRC in wet storage, we did some	13	LINGL.
	14	comparisons of the predictions of our program with the	14	MK. GAUNDER: I want to go on the record to
<b></b> 1	1	the bins of ables programs the course of validating	115	say that he will be testilying to paradiaph of that o
	115	predictions of other programs the course of versations	115	the state that the shout the degradation of
	15	our code. It was not specifically comparing a wet	16	in the declaration, talking about the degradation of
	15 16 17	our code. It was not specifically comparing a wet storage analysis by our code with a wet storage	16 17	in the declaration, talking about the degradation of concrete due to heat transfer in a tipover condition.
	15 16 17 18	our code. It was not specifically comparing a wet storage analysis by our code with a wet storage analysis by another code.	16 17 18	in the declaration, talking about the degradation of concrete due to heat transfer in a tipover condition. And I want to clarify one other point. I
	15 16 17 18 19	our code. It was not specifically comparing a wet storage analysis by our code with a wet storage analysis by another code. 0. Okay.	13 16 17 18 19	in the declaration, talking about the degradation of concrete due to heat transfer in a tipover condition. And I want to clarify one other point. I had thought that paragraph No. 22, which we didn't have
	15 16 17 18 19 20	our code. It was not specifically comparing a wet storage analysis by our code with a wet storage analysis by another code. Q. Okay. A. (DR. SOLER) Simply pick a problem that had	16 17 18 19 20	in the declaration, talking about the degradation of concrete due to heat transfer in a tipover condition. And I want to clarify one other point. I had thought that paragraph No. 22, which we didn't have anybody to identify, would be Alan Soler separately.
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In the matter of: Private Fuel Storage Trishna P. Singh & Alan I. Soler, Vol. II \* November 16, 2001

	Krishna P. Singh & Alan I. Soler	r, V	01. 11 * November 10, 2001
	BAGE 97 07		PAGE 99 QQ
		1	That was my answer
$\mathcal{A}$	A. (DR. SOLER) No, other than the limited	1 5	D No I'm sorry I'm skipping over questions
2	reading I gave it four years ago, five years ago.		U. NO, I M Solly. I M Skipping over questions
3	Q. Are you aware that a major fault capable of	15	that were related to that. I'm sorry. I should have
4	generating a 6.5 magnitude earthquake could impact the	4	told you that.
5	PFS site?	5	In your analysis Hi-2012040 1 m Solly, 1
6	A. (DR. SOLER) That sounds like a two-part	6	don't have a title. Do you know which report 1 m
7	question to me. Am I aware?	7	referring to?
8	0. Yes. Are you aware that a major fault	8	A. (DR. SOLER) Yes, I've got it in front of
Å	capable of generating a 6.5 magnitude earthquake could	9	me. Multi-cask Response at PFS ISFSI from 2,000-year
110	impact the PFS site?	10	Seismic Event, Rev 2.
	a (DR SOLER) I am not aware of it.	11	Q. Thank you. What is the maximum weight of a
112	Are you familiar with the term "near fault	12	single HI-STORM cask loaded with fuel assemblies used
12	offosts" for earthquakes?	13	in that report?
	effects for earthquakes.	14	A. (DR. SOLER) 360,000 pounds.
14	<b>R.</b> (DR. SOLER) Not leasing.	15	0. And did you consider a minimum weight in
112	U. Inen 15 it fall to say that you did not	16	that report?
10	CONSIDER Real laure effects in your cash scaping	17	A. (DR. SOLER) No. we considered one weight.
	analysis lor the hi-sloke ive at the res site:	18	0. With respect to your cask stability analysis
18	MK. GAUNLER: UDjection. Inere is no basis	10	for a 10 000-year return period. Holtec report No.
19	for him to say whether he knew whether he did of	20	HT_2012780 did you use the same maximum weight that
20	whether he didn't.	21	you used in the previous report for a single HI-STORM
21	Q. (BY MS. NAKAHARA) Did you	21	you used in the previous report for a bingre at breat
22	MR. GAUKLER: He's already described that he	22	
23	got input through Geomatrix.	23	<b>A.</b> (DR. SOLER) les. 0 Back to the 2 000-year report HI-2012640
24	Q. (BY MS. NAKAHARA) Did you consider near	24	U. Back to the 2,000-year report, hi-2012040,
25	fault effects, to the extent you know, in the cask	25	and you use values for alpha damping co-efficients in
••	Tour critered to end enter free free free free free free free f		
<u></u> ر	PAGE 98 00		PAGE 100 100
ĺ.	PAGE 98 98 98	1	PAGE 100 100
	PAGE 98 98 98 98 98 98 98 stability analysis for the HI-STORM 100 at the PFS site	1	PAGE 100 Code MR2V181.EXE for dynamic simulation? I (DR SOLER) No.
1 2	PAGE 98 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period?	1 2 3	PAGE 100 Code MR2V181.EXE for dynamic simulation? A. (DR. SOLER) No. Did you use values of beta damping for the
1 2 3	PAGE 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year.	1 2 3	PAGE 100 Code MR2V181.EXE for dynamic simulation? A. (DR. SOLER) No. Q. Did you use values of beta damping for the same code for dynamic simulation?
1 2 3 4	PAGE 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year. A. (DR. SOLER) I considered the earthquakes	1 2 3 4 5	PAGE 100 Code MR2V181.EXE for dynamic simulation? A. (DR. SOLER) No. Q. Did you use values of beta damping for the same code for dynamic simulation? A. (DR. SOLER) Yes
1 2 3 4 5	PAGE 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year. A. (DR. SOLER) I considered the earthquakes that were given to me. The basis for those earthquake	1 2 3 4 5 6	PAGE 100       100         code MR2V181.EXE for dynamic simulation?       100         A. (DR. SOLER) No.       0.         Q. Did you use values of beta damping for the same code for dynamic simulation?       100         A. (DR. SOLER) Yes.       100         O.       What beta value did you use?
1 2 3 4 5 6	PAGE 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year. A. (DR. SOLER) I considered the earthquakes that were given to me. The basis for those earthquake time histories I'm not familiar with.	1 2 3 4 5 6 7	PAGE 100 Code MR2V181.EXE for dynamic simulation? A. (DR. SOLER) No. Q. Did you use values of beta damping for the same code for dynamic simulation? A. (DR. SOLER) Yes. Q. What beta value did you use? A. (DR. SOLER) That number appropriate to 5
1 2 3 4 5 6 7	PAGE 98 Stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year. A. (DR. SOLER) I considered the earthquakes that were given to me. The basis for those earthquake time histories I'm not familiar with. Q. And will you clarify, did you calculate the	1 2 3 4 5 6 7	PAGE 100       100         code MR2V181.EXE for dynamic simulation?       A. (DR. SOLER) No.         Q. Did you use values of beta damping for the same code for dynamic simulation?       A. (DR. SOLER) Yes.         Q. What beta value did you use?       A. (DR. SOLER) That number appropriate to 5
1 2 3 4 5 6 7 8	PAGE 98 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year. A. (DR. SOLER) I considered the earthquakes that were given to me. The basis for those earthquake time histories I'm not familiar with. Q. And will you clarify, did you calculate the design-basis ground motion yourself or rely on	1 2 3 4 5 6 7 8	PAGE 100 Code MR2V181.EXE for dynamic simulation? A. (DR. SOLER) No. Q. Did you use values of beta damping for the same code for dynamic simulation? A. (DR. SOLER) Yes. Q. What beta value did you use? A. (DR. SOLER) That number appropriate to 5 percent damping. Q. had with respect to the 2 000-year cask
1 2 3 4 5 6 7 8 9	PAGE 98 98 stability analysis for the HI-STORM 100 at the PFS site for a 2,000-year return period? MR. GAUKLER: Same objection on 2,000-year. A. (DR. SOLER) I considered the earthquakes that were given to me. The basis for those earthquake time histories I'm not familiar with. Q. And will you clarify, did you calculate the design-basis ground motion yourself or rely on Geomatrix? You told me what you received, but I guess	1 2 3 4 5 6 7 8 9	PAGE 100 Code MR2V181.EXE for dynamic simulation? A. (DR. SOLER) No. Q. Did you use values of beta damping for the same code for dynamic simulation? A. (DR. SOLER) Yes. Q. What beta value did you use? A. (DR. SOLER) That number appropriate to 5 percent damping. Q. And with respect to the 2,000-year cask stability analysis HI-2012640 what mathematical model
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