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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.	)
	) DEPOSITION OF:
	)
(Private Fuel Storage Facility)	) **STEVEN FLOYD BARTLETT, PH.D.**
	)
	) **(Utah Contention L)**

November 2, 2001 - 8:47 a.m.

Location: Parsons Behle & Latimer
201 South Main Street, Suite 1800
Salt Lake City, Utah

Reporter: Susette M. Snider, RPR, CRR
Notary Public in and for the State of Utah

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NUCLEAR REGULATORY COMMISSION

Docket No. 72-22 Official Exh. No. PFS Ex. 244

In the matter of PFS

Staff ______ IDENTIFIED ✓

Applicant ✓ RECEIVED ______

Intervenor ______ REJECTED ______

Cont'g Off'r ______

Contractor ______ DATE 6-27-02

Other ______ Witness Bartlett

Reporter R. Davis

plan to do that, yes.

MR. GAUKLER: I would request copies of these documents that Dr. Bartlett is referring to.

MS. NAKAHARA: Okay.

THE WITNESS: They're a slide set.

MR. TURK: I'll renew my request from the other day, that if you do produce documents to Paul Gaukler and PFS, please provide a copy to us.

Q. (By Mr. Gaukler) Let's go back. You identified four topics that you had discussed, 1020, tipping, sliding, case history. We've already talked about case history. Let's go back and talk about DOE-1020. What generally were the nature of the conversations with respect to DOE-1020?

A. Dr. Arabasz was leading the discussion, but in his review of 1020 and knowing that Dr. Ostadan and I had both had some experience in our past with DOE-1020, his line of reasoning was that it's not entirely proper to set a design basis ground motion without first establishing a performance goal.

And we reviewed kind of the philosophy of 1020, and I think at least my review of it was that -- yes, that the first steps in 1020 was first, in the graded approach, which 1020 is, is to categorize the particular facility to a performance category. Once that has been established, then DOE has a particular performance goal that has been established for that performance category. And then it's the intent of 1020 to show that the facility meets that performance goal, which is usually -- which is in probabilistic terms. That goal is in probabilistic terms.

So I guess we concurred with Dr. Arabasz's review of 1020, that the basis of setting the design basis ground motion begins with establishing a proper performance goal which is a risk-based goal.

Q. And did you talk about what you view to be the proper risk-based goal for the Private Fuel Storage Facility?

A. No, I don't think that the discussion was headed as much in that direction as was asking Dr. Ostadan and my opinion had that performance goal been met by even accepting the -- the proposed design, the 2,000-year return period proposed design motion.

Q. And how did you respond?

A. My opinion was that we couldn't really determine whether the performance goal had been met because of the issue with these reduction factors that are used in reducing the hazard. Those reduction factors that we discussed yesterday for the structure system and components, we're really not sure whether they would apply to a case of casks sliding on pads because of the interface issues that we discussed. And, also, we had not seen any, what I would term, fragility curves which show level of damage as a function of ground motion that had really been developed for the -- for the foundation systems. So I guess we could not conclude whether we -- we felt whether the performance goal had been met by the calculations that have been done.

Q. Now, you say that you have had some experience with DOE-1020.

A. Correct.

Q. Could you please describe for me --

A. I was an employee of the Savannah River site for Westinghouse Savannah River Company from 1991 to 19 -- early 1996. Part of my responsibilities was to work in a group that did seismic qualification of DOE facilities at the Savannah River site. We applied 1020 and other DOE standards to design.

Q. And how did you apply 1020? What facilities did you apply it to, for example?

A. The first facility that I was heavily involved with was the in-tank precipitation plant. And it was an existing facility, and DOE was having us evaluate the seismic design of that facility to see that it met the intent of standard -- DOE-STD-1020. That later was extended to -- this plant that I referred to is essentially four tanks. Later we had to then do the same type of process for all of what we called the H tank farm, which was the high-level waste tank farm at Savannah River.

Those were the two major projects that were going on while I was there. There's some ancillary smaller things I guess I could get into, but those were the main ones.

Q. These would be the most relevant of --

A. Most relevant, correct.

Q. Okay. How did you go about applying 1020 to, say, the first one, the in-tank precipitation plant?

A. The issues at the in-tank precipitation tank were truly geotechnical issues. There was a postulated possibility of liquefaction underneath these tanks, and, of course, then wanted to -- DOE wanted to explore then what would be the consequences of liquefaction.

The performance goal I think for that facility was a Performance Category 3, which meant the goal would be $1x10^{-4}$ probability of failure. In this case failure was deemed liquefaction because once liquefaction occurred, that was deemed a fairly uncontrollable event and its consequences would be relatively severe. So this was to come up with what was the probability of liquefaction at that facility, and a probabilistic liquefaction hazard assessment was made. And through coupling the probabilistic liquefaction hazard assessment with the probabilistic ground motion hazard assessment, we showed that the -- the potential of liquefaction at that site was below the -- the performance goal threshold.

Q. Of 10^{-4}?

A. Of 10^{-4}, correct.

Q. What were the consequences of liquefaction if liquefaction did occur?

A. In this case it would be excessive settlement, which could then potentially rupture the bottoms of the tanks, and then the leakage of the high-level waste into the groundwater, uncontrolled radiological release.

Q. This was liquid high-level waste?

A. Yes, I -- it was liquid high-level waste, but when they explained it to me, they said it had more the viscosity of Vaseline. So that was my reference.

Q. Okay. Hadn't been solidified, at least?

A. No, it was not. In fact, the in-tank

precipitation process was to take the radioactive component out of the liquid waste, separate it, and then that higher concentrated waste was being sent to the vitrification building which Savannah River currently operates.

Q. And in doing this calculation, did you prepare any fragility curves or anything like that?

A. Not in the sense of a structural fragility curve, no. Again, we had to come up with the probability of liquefaction, which considered a full suite of earthquakes and their relative probabilities, and then coupled with a conditional probability of liquefaction given the motion. So we came up with just a probability of liquefaction.

I think that our approach was, at that point, that if liquefaction could be shown that it had a low enough probability of occurrence, there wasn't any really need to go ahead and do the more difficult analysis that really now tries to assess, if it did occur, what would be the size of the cracks and the potential for leakage. That's relatively complex. So I think our intent was to show the probability of liquefaction was low enough, hence, any consequences of it would not be --

Q. And because of that you probably didn't get into any risk reduction factors either?

A. I'm not sure quite how to apply risk reduction factor to -- to the ground. I think the issue that I have with risk reduction factors in geotechnical engineering is -- I'll put it this way: It's easy for a structural engineer to add extra detailing, sizing of beams and members and things, to add extra conservatism in their design. Unfortunately, in geotechnical engineering, we have to sometimes take the ground as an as-is condition, unengineered, so I'm not sure exactly what risk reduction factors mean to a geotechnical engineer.

We're sometimes asked more to present a real assessment of the hazard. I guess if we had to decide to remediate, then we could look at maybe risk reduction factors in the sense that -- if we modified the ground or something, but it's -- it's not quite as clear-cut how we apply that risk reduction factor, I think, to a geotechnical condition.

Q. Could there be procedures by which you'd go about to identify the various geotechnical parameters that would imbue conservatism in the process?

A. Well, what we tried to do is make a realistic assessment of not only the conditions but the potential variability. And so coupled in in the were doing, say, first in the environmental restoration department, when you were there?

A. Site assessment.

Q. Site assessment?

A. Correct.

Q. And the site assessments would focus on geotechnical issues --

A. Geological, ground water issues, contamination issues.

Q. And what was the nature of your work when you were a supervisor of the engineers in the site geotechnical services department?

A. It was seismic qualification.

Q. And by seismic qualification, you mean what?

A. DOE wanted its existing facilities to be evaluated according to DOE-STD-1020 and make an assessment of that, also, if there were new facilities to be designed and built, also to make sure that they met the intent of Standard 1020.

Q. And did you do any seismic qualification, other than what we've discussed in the context of 1020?

A. As I recall, the major facilities were ITP, H tank farm. I did do a little bit of review for the replacement treating facility, called RTF, and a little bit of review of the foundation assessments for the defense waste processing facility, which is the vitrification building.

Q. And generally, in doing this type of work, what type of activities would you be involved in?

A. Supervising the gathering of subsurface information as borings, as cold penetrometer subsurface data, assimilating that into a design profile, evaluating the foundations to seismic hazards.

Q. Let's turn to your experience with respect to Woodward-Clyde, and would you please tell me generally your responsibilities when you worked for Woodward-Clyde?

A. There I was a project engineer.

Q. And what were you responsible for as a project engineer?

A. Initially when I came back to Salt Lake City, we were involved in projects that were part of the State of Utah's program to retrofit dams or upgrade dams seismically. We had projects that we were doing regarding that. I was somewhat involved with the Magna tailings impoundment project here in Salt Lake Valley. Then we won the I-15 reconstruction project, and I spent about a year in geotechnical design for that project.

to what's being proposed here.

Q. When you say, "slightly more conservative," you mean it's a higher --

A. Higher levels of motion, yes.

Q. Do you know anything about the risk reduction factors in bridges, say, compared to the risk reduction factors in nuclear grade design and construction?

A. I'm not sure I can compare. I'm not a structural engineer, so I'm not sure I can talk about the risk reduction factors or redundancy of bridges compared to nuclear facilities under NRC jurisdiction.

However, there was an interesting thing during the design that the design basis ground motion was put forward, but I'm not sure UDOT clearly identified what was the performance goal for the bridges. So we who were applying the design basis ground motion asked, What is your expectation of how the bridge should perform given this design basis ground motion? And they wanted it to be in service with little to no damage, was their words.

Q. Under what circumstances?

A. The design basis ground motion, the 2500-year return period.

Q. So they wanted the bridge to be in service with little or no damage for a return period earthquake of 2500 years?

A. That was the performance goal.

Q. Okay.

A. It's not probabilistic. It's simply that it's in service and functional.

Q. Now, the other area that we discussed where you have some experience and background potential is DOE-1020. Do you expect to give any testimony with respect to DOE-1020?

A. I think Dr. Ostadan has used that document more extensively than I have, so I plan not to. I'll be deferring to his testimony.

MR. GAUKLER: Let's take a break.

(A recess was taken.)

MR. GAUKLER: Let's go back on the record.

Q. Going back to the design of interstate highway bridges in the state of Utah --

A. Yes.

Q. -- first of all, you said that Utah uses a 2500-year return period --

A. Yes.

Q. -- for the design of bridges. Is that for all interstate highway bridges?

A. For all interstate highway bridges, I differences in stiffnesses of the two -- the pads are very stiff relative to the soil cement -- that there's going to be additional cracking and soil structure interaction issues.

But, again, these are Dr. Ostadan's areas of expertise. I think I generally understand what's going on, but the relative consequences and the magnitudes I'm not prepared to testify to.

Q. Okay. Let me just ask you what you think the consequences of sliding would be with respect to the canister transfer building.

A. Because of the size of the footprint of the building, my intuition -- and this is, again, intuition because we still haven't had what we think a proper evaluation of the dynamic loadings, so it's hard to say exactly. But because of the size of the footprint, the displacements resulting from sliding would be somewhat less.

Q. So there would be less sliding --

A. Yes. It's a larger structure, larger footprint, so I think the consequences of sliding of the canister transfer building would be not as severe as the potential sliding of the pads. But that's just a qualitative assessment based on just intuition.

Q. And same thing's true with respect to the overturning of the pads as well, correct?

A. It's hard to envision an overturning mechanism for something that large.

Q. Right. So you don't see that as a potential failure mechanism, then?

A. Dr. Ostadan actually did more of the review of the overturning calculation, so my testimony would probably have to defer to what he said. I'm not sure if we've had new issues with overturning, but he may have some.

Q. Do you recall rasing that with respect to Utah QQ?

A. That's what I don't remember. If I remembered exactly, then I would say what I think we had said in QQ, but I'm not sure about overturning the canister transfer building.

Q. Consequences of lack of bearing capacity with respect to the canister transfer building, any opinion on that?

A. Possibly localized failure along the edges of the mat. But, again, it's a larger footprint so bearing capacity failure is a harder mechanism over that large of a footprint, but, again, I'll refer to Dr. Ostadan's evaluations.

MR. GAUKLER: I think I've run out of