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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF THE SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

Before the Atomic Safety and Licensing Board

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

Wednesday, March 6, 2002 - 9:12 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

~~NUCLEAR REGULATORY COMMISSION~~

Docket No. _____ Official Exh. No. 224

In the matter of _____

Staff _____ IDENTIFIED

Applicant RECEIVED _____

Intervenor _____ REJECTED _____

Other _____ WITHDRAWN _____

DATE 06-03-02 Witness Khan

Clerk Susette Snider



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SECY-0

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1 Off the record.

2 (Discussion off the record.)

3 A. (DR. SOLER) Okay, now ask your question
4 again.

5 Q. Is it fair to characterize your response in
6 the last deposition, or I guess in general that NRC had
7 compared portions of what I now know as Dynamo for wet
8 storage to other nonlinear codes?

9 A. (DR. SOLER) Well, I'm not sure what the NRC
10 has done independently, but as part of a number of
11 submissions for particular utilities in wet storage
12 applications, we were of course asked questions by the
13 NRC staff reviewer, and previous to the submittal we
14 were also sometimes asked questions by the utility
15 reviewers before submittal. And if you take all of the
16 submittals that we've made since when we started and
17 through the wet storage period, there have been a whole
18 range of problems considered. And there of course is a
19 validation report that's been issued with different
20 classical problems, both linear and nonlinear. Their
21 "exact" solutions or their numerical solutions from
22 other sources were compared with the results that we
23 would get for the same problem.

24 So while you could not say that a particular
25 wet storage submittal was completely modeled by another

1 program and compared with the results that we got,
2 portions of the program were compared by testing the
3 problem that had been done in the literature, or, in
4 one case, a finite element model using ANSYS that was
5 made up by a utility to characterize all of the
6 features like nonlinear springs and gap elements that
7 was in their model.

8 Q. You mentioned a validation report. Is this
9 a formal document that's submitted to NRC?

10 A. (DR. SOLER) Yes, I believe it's in the
11 public document now.

12 Q. And approximately how large is that
13 validation?

14 A. (DR. SOLER) Like that (indicating). I
15 believe, maybe I'm wrong, but we submitted at one time
16 a table of contents to that report.

17 Q. Did you submit a validation report with the
18 TSAR?

19 A. (DR. SOLER) No.

20 Q. Dr. Singh, do you want to add?

21 A. (DR. SINGH) May I supplement the response?

22 Q. Yes.

23 A. (DR. SINGH) One of the essential
24 undertakings we have in nuclear plant design and
25 analysis activities is to ensure that the computer

1 codes we use are thoroughly checked and validated.
2 It's one of our simple commitments in designing and
3 doing analysis. This computer program Dynamo has been
4 the workhorse for the industry, over 60 nuclear power
5 plants. The fuel racks in the pools are designed and
6 analyzed and the safety margins established using this
7 program. So of course we placed a great deal of
8 emphasis on validating it against a variety of
9 potential problems and characteristics of problems.

10 NRC over the years also, because the code
11 was increasingly -- had become increasingly -- had
12 become the vehicle for establishing margins of safety,
13 asked us to perform some rather extreme validations.
14 We picked out, for example, problems from the
15 literature where solutions may be nonunique, truly
16 nonunique problems, the problems that have bifurcation,
17 for example. And we demonstrated this program could
18 simulate that, even those rather arcane physical
19 problems.

20 So this program has gone through very
21 extensive valuation, far more than a general purpose
22 program such as ANSYS would be for this class of
23 problems, because it's very focused. It's focused on
24 freestanding structures with potentially rattling
25 masses inside. Okay? So that's the general sense I

1 want to give you.

2 Q. Okay, thank you. The validation reports,
3 are they submitted with each use of Dynamo?

4 A. (DR. SOLER) No. It's a one stair on the
5 docket, we simply refer to them.

6 Q. When was the last time the validation report
7 was updated, approximately?

8 A. (DR. SOLER) I probably cannot give you an
9 honest answer on that, because I just don't know. We
10 have validated various versions of the code as we've
11 upgraded, but our QA procedure, depending on the
12 upgrade, allows us to do an upgrade of the code by
13 comparing solutions from the previous version. It's
14 only when we introduce some new feature to the code
15 that can't be validated by checking it against the
16 previous solution. I would characterize most of our
17 recent changes in the code have been one of increasing
18 its dimensions so we can do larger problems and to
19 change output statements so we can get more information
20 out of the code. And of course, even though you change
21 something as mundane as an output statement, you still
22 have to ensure that inadvertently you haven't altered
23 some of the other features in the code.

24 So a general validation report has only been
25 updated when we've added a completely new feature that

1 we can't validate or that may affect some of our
2 validations, and to my knowledge, we haven't had to do
3 that.

4 Q. And does this validation report include a
5 description of what -- a general description of what
6 portion of Dynamo was compared with what specific
7 model?

8 A. (DR. SOLER) Well, the validation report is
9 broken up into a series of I believe 12 to 14 test
10 problems which come from various sources in the
11 literature or from running a finite element code such
12 as ANSYS. These problems are described the way the
13 literature describes them, and then we describe how we
14 model that particular problem, what it is supposed to
15 check. And then of course we give our results and
16 compare them with the results in the literature.

17 Clarify a little bit: when you asked me a
18 question about portions of the code that you're
19 checking, you should understand that a portion of the
20 code may be to check the performance of the gap element
21 model that's in the code. But the entire code is used
22 to run that particular problem, but we're focusing on
23 one aspect of the problem we're checking.

24 Q. Is it fair to characterize you're focusing
25 on a result, or --

1 A. (DR. SOLER) By example, if we are trying to
2 simulate an object -- let's keep it very simple. I
3 drop a ball, it bounces and comes back. There's a
4 classical solution for that; and in that analysis, if
5 we wanted to analyze that numerically with our code,
6 what we would be checking is the gap element model. We
7 would set up the data file, run the problem with our
8 gap element, and compare the results that we get with
9 the results in the classical literature.

10 Q. Dr. Soler, have you used ANSYS for any
11 nonlinear analysis in general?

12 A. (DR. SOLER) Yes.

13 Q. Have you used it for any cask stability
14 analysis?

15 A. (DR. SOLER) No.

16 Q. When was the last time, to the best of your
17 recollection, that you used ANSYS?

18 A. (DR. SOLER) Personally as a user?

19 Q. Yes.

20 A. (DR. SOLER) Last night.

21 Q. That's recent. And do you believe you could
22 benchmark Dynamo with ANSYS?

23 A. (DR. SOLER) One of the early problems we
24 dealt with where we were benchmarking a code, a utility
25 made up a problem. In other words, they developed a

1 mass, spring, damper, gap element
2 model. Had no relation to the particular racks that we
3 were studying at the time, but it was made up for the
4 purpose of testing the results that they would get from
5 ANSYS and the results that we would get from our
6 program. So it did not specifically deal with racks
7 per se. And we got good agreement with their model and
8 their model.

9 In later years, for one of the projects that
10 we worked on we were directed to use ANSYS rather than
11 our code because of the review process involved. The
12 reviewers wanted a commercial code to be used, not a
13 special purpose code. So they directed -- the client
14 directed us to use ANSYS in our modeling of the spent
15 fuel racks. When we did that, the third-party
16 independent reviewer that the client engaged to check
17 our results independently used his version of ANSYS on
18 his computers and found that he got different results.
19 They were small differences in displacements, general
20 agreement in the forces.

21 At the time it was thought that perhaps the
22 problem had to do with the discrepancy in the Pentium
23 chips. That was when they first came out. But after
24 investigation we could not ascribe the problems that
25 were being seen to the Pentium chip. And during our