UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD

PANEL ON STRUCTURAL GEOLOGY & GEOENGINEERING
WORKSHOP ON THE EXPLORATORY STUDIES FACILITY (ESF)
DESIGN AND CONSTRUCTION STRATEGY

Plaza Suite Hotel
4255 South Paradise
Las Vegas, Nevada 89109

November 5, 1992

BOARD MEMBERS PRESENT

Dr. John C. Cantlon, Chairman
Nuclear Waste Technical Review Board

Dr. Edward J. Cording, Moderator
Nuclear Waste Technical Review Board

Dr. Clarence R. Allen, Member
Nuclear Waste Technical Review Board

Dr. D. Warner North, Member
Nuclear Waste Technical Review Board

Dr. John J. McKetta, Member
Nuclear Waste Technical Review Board

Dr. Garry D. Brewer, Member
Nuclear Waste Technical Review Board

Dr. Donald Langmuir, Member
Nuclear Waste Technical Review Board

Dr. Patrick Domenico, Member
Nuclear Waste Technical Review Board

ALSO PRESENT

Dr. Carl DiBella, Senior Professional Staff

Mr. Russell McFarland, Senior Professional Staff
KEY PARTICIPANTS:

Carl Gertz, Yucca Mountain Project Office
William Simecka, DOE
James Allan, Morrison-Knudsen, M&O
Robert Pritchett, Reynolds Electrical & Engineering Co.
Dale Frasier, Reynolds Electrical & Engineering Co.
Joseph Sperry, NWTRB Consultant
Hugh Cronin, NWTRB Consultant
Robert M. Matyas, NWTRB Consultant
S.H. Bartholomew, NWTRB Consultant
# INDEX

**SPEAKERS:**

<table>
<thead>
<tr>
<th>Remarks/Discussion</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Remarks</td>
<td>293</td>
</tr>
<tr>
<td>Dr. Clarence R. Allen, NWTRB</td>
<td>293</td>
</tr>
<tr>
<td>Introduction of Consultants</td>
<td>293</td>
</tr>
<tr>
<td>Dr. John Cantlon</td>
<td>293</td>
</tr>
<tr>
<td>Yucca Mountain ESF Design and Construction Program Management and Implementation</td>
<td></td>
</tr>
<tr>
<td>William Simecka, DOE</td>
<td>301</td>
</tr>
<tr>
<td>Dale Frasier, REECO</td>
<td>318</td>
</tr>
<tr>
<td>Round-table Discussion</td>
<td>336</td>
</tr>
<tr>
<td>Wrap-Up Discussion</td>
<td>422</td>
</tr>
<tr>
<td>Hugh Cronin, NWTRB Consultant</td>
<td>422</td>
</tr>
<tr>
<td>Joe Sperry, NWTRB Consultant</td>
<td>424</td>
</tr>
<tr>
<td>Bart Bartholomew, NWTRB Consultant</td>
<td>429</td>
</tr>
<tr>
<td>Robert M. Matyas, NWTRB Consultant</td>
<td>435</td>
</tr>
<tr>
<td>Dr. Edward J. Cording</td>
<td>437</td>
</tr>
<tr>
<td>Carl Gertz, Yucca Mountain Project</td>
<td>484</td>
</tr>
<tr>
<td>Round-table Discussion</td>
<td>444</td>
</tr>
</tbody>
</table>
DR. ALLEN: Okay. This is the second day of the meeting of the Panel on Structural Geology & Geoengineering of the Nuclear Waste Technical Review Board. In addition to the Board members that I introduced yesterday morning, two Board members have shown up subsequently; Don Langmuir who you heard from, as a matter of fact, yesterday afternoon and then this morning we have with us Garry Brewer.

So, without further ado, let me turn over the chairmanship of the morning session to John Cantlon.

DR. CANTLON: Well, I notice we managed to reduce our audience by about 50% which means that we now have only the dedicated. And, in the old days when I used to run a field class, I always scheduled it Friday afternoon because the only people that enrolled in my course were people that were committed and so I look at this as a real opportunity.

This morning, our session is going to address management and acquisition strategies, and while this is a Technical Review Board, the Board is continually pressed in Congressional hearings, in our budget hearings, special hearings, also pressed when we meet with the Nuclear Regulatory or with NARUC, the representatives of the rate payers, to comment on two aspects. One, in a sense, the assessment of the DOE management of the project; that's not what we were
commissioned to do, but nevertheless we get asked about that. And, the second thing we get asked about is what are the management and administrative repercussions of the recommendations and assessments we make? And, so we feel that it's extremely important that we hear from the DOE people some of the information that we haven't really been able to master fully. So, we'd like to have that as the output.

Now, the reason I'm chairing the session, I guess, I used to think that every organization needs an SOB. I spent six years managing the academic budget of a land grant university which today is about a $400 million operation. And, I also spent about 15 years managing the research side of the university which again today is around $200 plus million a year. So, I'm not unfamiliar with the kind of challenges that a management organization runs into and a lot of the shoal waters of making good management are things that almost no one except the managers who are sitting in that chair understand; the political realities, the regulatory realities, and so on.

Now, the Board has as its intent coming out of this and some of the prior sessions to generate a specifically focused mini-report. It won't be part of our regular reports. And, recall that we report dually to the Secretary of Energy and to the Congress. After January, we're going to have a brand new Congress. We have a brand new executive.
1 We have an opportunity here to essentially make a report that focuses on what this process is all about. There's far too much opinion around the country, both at the lay level and in the technical circles, that what we're looking at is an elegant dump, a multi-billion dollar dump. Nothing could be further from the truth. We're looking at the infrastructure and a very important infrastructure piece of this country's energy base. And, if we don't begin to think about this as the absolutely key infrastructure to the energy future of this country, then we have undersold what we're about. And, so getting a clear focus on what it is that we're doing, what it is DOE is committed to do with a great deal of anxiety broadly in the country, I think part of our difficulty is that we have sort of walled ourselves off and gone about it letting essentially the lay audience out there dictate what the national image of what Yucca Mountain is all about. Yucca Mountain, in point of fact, may be the world's most valuable energy mine. Think about that. It may, in fact, be the most valuable energy mine. And, so let's think about now managing this thing in terms of what it is, where we're headed, why we're headed that way, and if we don't do that, we've got 49 other states that have got a hell of a problem on their hands and those 49 states wield a lot more political moxie than the opposition to Yucca Mountain. So, it's extremely important then, I think, that we put this
in the right context.
Now, let me ask our consultants to give a sentence about their background in administration. And, let me first call on Bart Bartholomew.

DR. BARTHOLOMEW: Thank you, John.

As you say, my name is Bart Bartholomew. Currently, I teach construction management at a state university in California. Prior to that for the some odd 45 years of my professional career, I've been engaged in various phases of construction contracting, practically entirely as a member of a construction contracting organization. I've managed over a period of a number of years the heavy construction operations of a major national contractor who also did other types of work including nuclear related work. And, I might say that much of that latter number of years was in underground construction that my company primarily executed.

Since that time, since I've been teaching, I've operated as a construction consultant which has given me the opportunity to see quite a breadth of underground projects in this country over the last eight or 10 years and form a perspective into what some of the interfaces are between the contractors that are attempting to make a profit in the construction industry and achieve ends that the owners wish and the wishes of the owners. I've had numerous opportunities to see some of the conflicts that have evolved when those two
1 clash from the perspective of a third party observer rather than being a participant. And, I think my point of view in the comments I make today will come from that type of a background.

DR. CANTLON: Thank you.

Bob Matyas?

MR. MATYAS: Good morning. I've had a career in management and engineering. It probably breaks down into three categories. I worked for Admiral Richover in the early days of the AEC and built a lot of nuclear power plants for naval use, worked on the Central Station Power Plant and Shipping Port, went back to Cornell and I ended up retiring there in 1988 as the chief operating officer. And, the responsibilities included that I was the contract authority for the university. The university is a billion dollar plus budget a year and it's a major research institution and acts as an M&O for, I think, four national high-tech projects.

Since I retired, I've done a number of consulting assignments for a number of Government agencies including a year I spent in the startup of what is now known as a Superconducting/Supercollider laboratory in Berkeley. When the project was assigned to Dallas, I then spent about 10 months down there trying to start the project up and finally came back home and started to take care of my lawn.

And, I'm just pleased to be involved in this thing.
I once wrote to Admiral Watkins, whom I knew way back before he was an Admiral, saying if I can help in any way, I'd be pleased to. And, he never answered, but here I am.

DR. CANTLON: Hugh Cronin?

MR. CRONIN: My management experience would include 15 years as an engineer and manager for one of the major contractors in the United States. Following which, I've been 15 years as a consultant managing my own firm. And, in this consulting work, I would estimate that probably somewhere between a third and a half of the work that we do is involved with management. Currently, we're working for a mine and advising them on the best way to manage a major underground development in the private sector.

DR. CANTLON: Okay, thank you. And, Joe Sperry?

MR. SPERRY: I've worked in tunnels exclusively for the last 31 years. In 1984 and 1985, I was a consultant at Parsons-Brinkerhoff and their work at Yucca Mountain. So, I got familiar with your project there. I've hands-on operating experience with two tunnel boring machines. The first 20 years of my experience was pretty much with contractors. The last 10 years has been almost exclusively with owners.

DR. CANTLON: Okay. Well, let's go now to the program.

DR. CORDING: I'd also like to just introduce the other members or key participants at the head table here today. Perhaps, we could have them just briefly state their back-
1 grounds.
2 We have Dale Frasier with the Reynolds Electrical
3 Company across from me.
4 MR. FRASIER: Thank you, Ed.
5 I'm Dale Frasier, President and General Manager of
6 Reynolds Electrical & Engineering Company. I've held that
7 position for about six years. Prior to that, for eight years
8 I was the deputy general manager. Prior to that, I was a
9 division manager for REECO since about 1970. My background
10 is in construction, engineering, and mining.
11 DR. CORDING: Thank you.
12 And then, Bob Pritchett, also with Reynolds Elec-
13 trical.
14 MR. PRITCHETT: Thank you, Ed.
15 I've been with REECO for 25 years associated with
16 the weapons testing program in the beginning. Background is
17 mining and geological engineering and mining engineering.
18 I'm presently a division manager within our company and
19 technical project officer for our company's support efforts
20 associated with the Yucca Mountain Project.
21 DR. CORDING: Thank you, Bob.
22 And then, also Jim Allan, Morrison-Knudsen.
23 MR. ALLAN: Thank you, Ed.
24 I'm a lifelong employee of Morrison-Knudsen &
25 Company. Been in the management side of the house, the
project management side, for more than 20 years. I've worked on a large number of commercial large programs and this is my fourth DOE program that I've been involved in in the last 10 or 12 years. I might just add that I worked for Mr. Cronin when he was a manager of a major U.S. corporation.

(Laughter.)

DR. CORDING: All right. Two gentlemen you know very well here, but I'll let them also speak. We have Carl Gertz of DOE--you know him as the manager of the program--and Bill Simecka. Bill, any comments that you would wish to make?

DR. SIMECKA: Well, I guess I can tell a little bit about my background. I've had about 40 years of experience, mostly in the Federal Government defense industry, and both as a Federal employee at China Lake, California, as well as 10 years in the aerospace industry. And, I spent 12-1/2 years at Livermore in charge of all the engineering up there, mechanical engineering, before coming to this project and I've been in my position as the head of engineering development division for nine months.

DR. CORDING: Okay, thank you. Carl?

MR. GERTZ: First of all, I'd apologize for being a little bit late, but another one of my oversight groups had me tied up this morning. Commissioner DePlank from the NRC was in town. So, one of the five NRC Commissioners was touring the mountain today and so we look forward to that.
I am the Yucca Mountain Project Manager. I've been the project manager for five years here in Las Vegas. I'm a civil engineer by my original degree. I have post-graduate studies in various areas. I've been 30 years in the civil engineering project management field and we're eager to continue the dialogue we started yesterday.

DR. CORDING: Appreciate that, thank you.

Well, Bill Simecka, you're up.

DR. SIMECKA: I'd like to have two presentations today to introduce this session. The first one that I will do has to do with your question about how are we organized on ESF design and construction management. I will present that and then I think it's important because of some of the questions that came up and noted in your agenda that Dale Frasier, president and general manager of REECO, tell you about how he operates at the NTS and answer questions that you've had with regard to union standards, cost of doing business, sub-contracting out on a fixed price or otherwise basis. And, I think that kind of input would be very useful to you to maybe answer a lot of your questions.

Okay. As I say, I'm Bill Simecka. I ought to mention that I'm charge of the engineering and development division of the Yucca Mountain Project and, in addition to ESF, I have three other areas that I'm responsible for; waste package, repository, and system engineering.
To handle the ESF, Ted Petrie handles all of the ESF activities, design and construction, and you met him yesterday. The organizations supporting me in this endeavor are these. As we told you yesterday, we have transitioned the ESF design from Raytheon to the M&O on the 1st of October. So, all of the ESF design from here on will be done by the M&O. The M&O also is responsible for construction management support and I'll show you how that works in a moment. The construction itself has been REECO and its subcontractors and we're going to be awarding the--or REECO is going to be awarding the subcontract to help with the underground construction in the January time frame. And, of course, procurement is also the responsibility of REECO.

This is the construction management organization. As I said, I am responsible for this and Ted Petrie is responsible to me for all the design and construction. And, under him, there is a construction management office consisting of an individual reporting to him who is a DOE person. His name is Tom Fortner. And, supporting him is an M&O construction management organization and Jim Allan is the construction manager of that office. And, under him, he will be responsible for all these activities. He will essentially help Tom Fortner make sure that all of the activities associated with getting the construction done in an efficient and an effective and a safe manner and these people will be
1 working with all of the organizations involved; with the
2 safety people, with the environmental people, with the con-
3 struction people, with the design people, and so forth. And,
4 with regard to the construction activities, the constructor
5 and his people out in the field will report basically to Tom
6 Fortner.
7    Now, that's all I had to say about that. Are there
8 any questions?
9    MR. SPERRY: Bill, REECO reports to DOE, is that what
10 you're saying?
11    DR. SIMECKA: REECO is--as far as the construction
12 activities in the field, our DOE person out there manages all
13 that. This is from a management standpoint of making sure
14 all the activities are done as we'd planned to do them.
15 REECO itself is an M&O contractor with the Nevada field
16 office.
17    MR. SPERRY: And then, Jim Allan gets involved essen-
18 tially as an advisor to Tom Fortner?
19    DR. SIMECKA: That's correct.
20    MR. SPERRY: Okay.
21    MR. GERTZ: Just picking up a little bit on yesterday,
22 if it were a perfect world, I'd like to have a lot more
23 Federal employees and I only have about 70 distributed all
24 across the program. As a result, we use the M&O organization
25 to provide us advice, counsel, and help us carry out the
MR. MATYAS: Bill, I think after sitting through this yesterday and reading the material that I understand, somewhat, the matrix, but I think some of you in this room will agree with me it's not a conventional matrix. I listened to what I thought were very excellent presentations by the Department of Energy representatives here. Mr. Gertz has an unusually detailed knowledge of a large project. Project managers, as I know, have flanks of people that answer all their questions. He seems to be able to handle that.

MR. GERTZ: I wish I had more flanks yesterday.

MR. MATYAS: Well, I guess I wanted to say that this management structure is an exception to the normal—what you normally find in the construction process. Now, there was a time when I used to teach in our graduate school of business and all kinds of great innovations in how to manage all kinds of entities, I always came down to a point by saying, look, any system will work if everybody knows the rules. Or, putting it another way, you can't have an effective choir unless you're all using the same hymnbook.

I worry and I wonder if you could comment on how this project is geared to handle the management control aspects, the communications that must go to all parties, and I guess I'd like to know who is the Hyman Richover of it if there is such a person? Where is the leadership? Is it
diffused because it seems to me that it's currently diffuse. And, as I say, it might work. It very may well work. There are a lot of dedicated people here. As a matter of fact, I'd like to also say that I gathered—it was pretty clear to me that there's enormous amount of talent on this job. But then, I wonder, you know, what's the effective use of that talent? When I bought my first IBM PC, I was very thrilled with it. But, I got very frustrated because I realized that I could only use about 10% of its capability and I guess I feel a little soft spot in my heart for some of the people here who have ability and at least it isn't clear to me that there's a way for it to be applied in a, you know, nice strong vector.

DR. SIMECKA: Well, let me just mention that the way Carl has organized, he holds me accountable for all the engineering and construction activities at the site. And, you know, that's design and construction. We have detailed plans that we have made costed out and authorized each of those people to do their part of that. And, we manage that on a--especially in the construction, we have to watch over that on a daily basis. You cannot let the construction activities go without being managed on a daily basis. Now, that solid line from REECO to the construction management office is a oversight role. I mean, that line is DOE manages the REECO contractor in an oversight role. REECO has
detailed construction plans and so forth that they manage as a constructor and so it's just an oversight role. We're not getting in the middle of what REECO is doing. They know how to do these construction projects, but we do have to over-
sight it and make sure that everything else that has to feed that system is there when it's needed.

MR. GERTZ: I think you're really asking a question that I have an answer because, you know, you asked who is in charge? And, unequivocally, I'm in charge. Let me tell you how we go about managing that because we didn't spend time on the management structure and that's another, you know, one hour presentation that I'd be glad to do with you some time about our cost schedule control system and who is respon-
sible.

But, I did put this chart up yesterday and that was the participants and that shows my project office with the M&O team to help us carry out the activities across the program. Each of these entities has not only a nine year plan to the end of the program, but a one year plan with specific milestones. There's 6,000 activities that have been scheduled, costed, and with milestones on them. We look at the big picture, of course, to get to 2001, but we look at the next year in very close detail, maybe 40,000 or 50,000. We have the traditional integrated--it's not traditional, in fact. It's probably one of the best systems I've seen for
integrating cost, schedule, and technical baseline.

MR. MATYAS: And, you folks manage that in your division?

MR. GERTZ: We manage that right here, that's correct. We have a monthly meeting that shows up variances across the project. Let me show you what my office is broken out so you can tell a little bit how we manage this entire suite of contracts. I don't manage it individually myself. I have people that manage different aspects of it. I do conduct a monthly meeting that talks about the performance measurement of the project, highlights variances with all my team members, meaning my Federal staff and some of the M&O staff. I also have a monthly meeting with these people on this chart to express their concerns.

MR. MATYAS: Could I ask you with all the entities there, will your integrated project control system--does that communicate--the other people read that, can they get it on the wire?

MR. GERTZ: Yeah, they've used it. Larry Hayes manages with it. He has a stack of what we call PEX cost accounts and summary accounts that lays out the trenching, the analysis he has to do by milestone, and he gets his monthly variances and that's what he uses to plan and manage it. Russ Dyer, who was up here yesterday, made a tremendous impression on the OMB when they were out here. They said,
well, Dr. Dyer, you know, you're a fine scientist, a PhD in geology, but how do you manage this? And, he brings out his printout and says here's how I manage it. I know with the USGS, it's off schedule or I know what Lawrence Livermore is doing.

MR. MATYAS: How about REECo, SAIC--

MR. GERTZ: The same thing. They all have cost--everyone on this chart is a participant in one of the 6,000 accounts--

MR. MATYAS: In that vernacular, in that system. They don't each have systems of their own?

MR. GERTZ: No, they have their own--their systems is compatible with rolling up into ours. Each one of them, they all work on the same work breakdown structure. We have the same reporting requirements. There's a little bit different idiosyncrasies at the lower levels, 6th and 7th level of the WBS, but they all roll up into our overall project management system.

MR. MATYAS: Do you have any influence? Could you suggest that the Supercollider Project do the same thing?

MR. GERTZ: Let me just tell you, people that were out here from PR-25 which is DOE's office, I had eight people last week reviewing the program. They said it's the best they've seen. It should be applied DOE-wide. They don't understand why it's not being applied DOE-wide. It's a very
1 disciplined approach to project management. I could spend, 2 you know, an hour on the approach, but it's discrete cost 3 accounts that have scope, schedule, and milestones for every- 4 body on here. Some are level of effort. You know, I won't 5 try to kid you. Some are level of effort, but others have 6 discrete milestones. But, you still know what's going on. 7 

MR. MATYAS: Let me pursue that a little further. How 8 about the response time? I remember working with a group on 9 the west coast and they had this great computerized system, 10 but it took 30 days to get an answer.

MR. GERTZ: It depends on what question you ask. We get 12 reporting in about 12 days at the end of the month and then 13 that summarizes our variances and we have our meetings about 14 --

MR. MATYAS: Let me ask how you, as the leader of the 16 project, if you have a question, do you wait 12 days for a--

MR. GERTZ: I do one of two things as the leader.

MR. MATYAS: You can get it off the top.

MR. GERTZ: Yeah. I do one of two things. If there's 20 an immediate crisis, I get my person responsible and the TPO 21 responsible and say let's find out what's going on. Other- 22 wise, I do management by exception, how's it going?

MR. MATYAS: So, you publish the hymnbook?

MR. GERTZ: That's correct. I publish the hymnbook and 25 I get sent to me the monthly report that lets me know how all
my division directors are doing and how all the participants are doing on that month's plan. And, I'll just--and, each cost account has a responsible individual. I mean, it's not just ambiguous. It's Russ Dyer responsible for this or Uel Clanton responsible for 1.2.3.2 or whatever.

MR. MATYAS: So, you can measure their performance as individuals?

MR. GERTZ: Measure their performances individually and as an organization. You know, as I said, if I sound enthused, I am because it's probably one of the best project management systems that I've seen and everybody that's seen it and spent time in the details of it really like it. Now, I'll be as honest as I can, we originally--it was best used a couple of years ago for our planning process. Just over the last nine or 10 months, we're starting to use it in the project control management process. We used it for planning and budgeting and now we're using the same database and starting to use it real hard for management. The reason we weren't able to use it much for management before, our baseline kept changing. We never knew how much money we were going to have each year.

MR. MATYAS: Very well. Thank you.

MR. GERTZ: Okay. And then, just to get on, I need to expand on this office up here because these are the people doing the work. As I said, they all have cost accounts and
responsibilities. Larry, I don't know how many summary cost accounts you have, but you probably have--

MR. HAYES: About 100 and some.

MR. GERTZ: 100 and some. And, I don't have that presentation here because I didn't think we were going to get in it, but I may even get it before lunch here.

Here is my office and it's not as untraditional as you would think from a construction project. This is the project team. I have, in effect, a couple line divisions. This is Bill Simecka responsible for ESF, field engineering, and systems. I have Wendy Dixon responsible for the environmental programs that go on out there. I have Vince Iori responsible for project control. I have Russ Dyer responsible for the technical, scientific part of the program. And, I have a representative in Washington and I have normal support from information resources, a site manager who coordinates the site activities out at Yucca Mountain, and an institutional staff with Ace Robinson and QC off to the side. But, each of these have performance responsibilities and I get a printout and say how did Mr. Dyer do with all his cost accounts last month and they all have milestones.

MR. MATYAS: I agree with you that's a very sensible and reasonable management organization.

MR. GERTZ: It's complex.

MR. MATYAS: Oh, of course, but when I said that the
management structure is an exception, I expected yesterday to start off and we'd hear only from the official M&O. My experience with Government agencies is they will hire somebody to operate it. You may have the wrong label. I mean, you are the M&O in a conventional sense.

MR. GERTZ: Well, not really. We rely on the M&O for a tremendous amount of support and analysis and expertise, you know. In my 70 people across here, I can't have experts like Jim Allan and other people across from M-K and Duke Engineering. So, we have a Federal responsibility to carry out this program though, you know. I believe I have a charter from the Secretary of Energy to be responsible for the program and I believe my staff has the same responsibility. And, while we have a multitude of support and we're going to rely on the M&O and the scientific contractors, the buck stops at the Federal people. They're responsible.

MR. MATYAS: Let me ask you about the scientific contract at the various laboratories. Do you buy their services like somebody would in the private sector? Do they bid on your scientific project?

MR. GERTZ: We do not, per se, bid on it. We chose at the beginning what we thought was the best suite of national labs, Federal agencies with the best expertise to do the job. So, we chose that. Now, they do provide cost estimates. I allocate all their funds. We've had great debates the last
1 two months as to how much money each person gets, Larry and I
2 and Tom and everybody. You may have sensed a little frustra-
3 tion yesterday. None of these people are getting exactly
4 what they want. I only had 244 million to distribute and I
5 had 300 million requested from this team. So, most people
6 didn't get what they wanted and everybody thinks their own
7 area is the most important in the near-term.
8    MR. MATYAS: How do you decide whether or not you're
9 going to renew one of their contracts?
10    MR. GERTZ: Well, we have a couple of ways that we do
11 business. One, it's my prerogative. So, if my scientific
12 staff says these people are not performing--and, I'll just
13 tell you, we had a little issue with the USGS two years ago
14 where we thought their geologic division was not being
15 responsive to the project. It was not carrying out the
16 program. Two, it was not under Larry Hayes' direct control.
17 It was a matrix support that I was unhappy with. I couldn't
18 get anybody to be responsible. I went to the USGS and, in
19 effect, said we need this direct responsibility management
20 part of our system or else I'm going to find someone else to
21 do the geologic studies. They indicated that they would
22 change their structure and provide Larry with the management
23 responsibility he needed so he could do it. So, if I'm
24 unhappy and my technical staff says things aren't going
25 right, I will find someone else to add to the chart.
MR. MATYAS: What you've said is you are clearly the client. Then, I have to say, you know, again it may be a matter of labels, but you have REECO and you have SAIC and you have M&O which has seven or eight--does that add to the difficulties?

MR. GERTZ: Of course, it adds to the difficulties, but it's not unlike managing a major construction project. You have a multitude of subcontractors. Someone does the dry-wall, someone does the electrical, someone does the plumbing. They even have subcontractors for suppliers for certain parts of the plumbing. So, it's not unlike in my experience of managing a major construction project. It's a little different since you have a lot more scientific disciplines. It's not quite as hardware oriented. You've delivering products that are intellectual products, reports, analysis.

MR. MATYAS: But, if I were a contractor trying to bid a job here, I'd need a program to decide where it's coming from.

MR. GERTZ: Yes.

MR. MATYAS: Between REECO giving me a contract and somebody else handing me a machine and an M&O playing a role and then, of course, your office so deeply involved in such detail, you're going to have to have a floor manager when we have a meeting.

MR. GERTZ: Almost, we do, but not quite. What you
described, once again, is not unusual when I was a project manager on construction projects. I mean, you bring your superintendent in, your project engineer in, you bring your major subcontractors in and they're going to have subs to them, and if you have an issue, you just go right down the chain-of-command. Everybody has a responsibility. We've tried to eliminate any overlapping responsibilities. As I said, the M&O, in effect, helps us manage it. This happens to have the number of FTEs and everything and their roles, the role of each of these contractors on here, but in effect, REECO is the constructor. They will have specific construction subcontracts and Dale will talk more about that. SAIC is more of a support services running information offices, tours, sample management facilities, providing support services, and then the specific expertise at the national labs, and then the M&O doing specific performing roles, as well as helping us integrate.

MR. MATYAS: Okay. I understand that. One last question and I'll let somebody else get onto this. Is it cost effective to have all of these activities out there? I mean, I would not be surprised if a lot of that happened just historically.

MR. GERTZ: Some of it did happen historically, but we've been evaluating and we've taken people off this chart and we've added some people to the chart as to the project
needs. So, we are constantly evaluating that. Cost effective becomes very subjective after a point of view. What are you paying for technical expertise and do you want the cheapest technical expertise or do you want the best and it may be a little costlier? And, you know, that's what we're trying to enforce, what is the best science?

MR. MATYAS: Thank you.

MR. GERTZ: We try to subcontract fixed price in construction and Dale will talk about that where we can through REECO, but a lot of it is not a definite scope of work and we'll talk about it. I, as having some experience in the construction field, do not want to get into prolonged litigation on construction contract claims. I'm not trying to have a suite of lawyers handling those kind of issues for me.

The other thing we do with these people, this contractor, REECO, SAIC, and the M&O all are on award fee. So, my staff determines what kind of fee that they get based on their performance. They are cost contractors. We pay their costs because we're telling them the scope of work that's cost reimbursable. But, their fee is determined in an award fee process.

MR. MATYAS: Thank you very much.

MR. GERTZ: Did that answer some of your questions?

MR. MATYAS: A lot of them.

MR. GERTZ: Okay. Bill, you wanted to continue or it's
1 Dale's turn?
2 DR. SIMECKA: I was at Lawrence Livermore Lab. I worked
3 in essentially a matrix organization. And, this is sort of a
4 matrix organization. If it's managed properly and we think
5 we are doing that, we enjoy a tremendous benefit that other
6 organizations don't have and that is each of those organiza-
7 tions, we're only using a small fraction of the Lawrence
8 Livermore Lab and the Los Alamos Lab and the Sandia and the
9 USGS. If we need expertise for any issue that is not now not
10 working on it, they can dig into their organizations and pull
11 those experts up at a moment's notice.
12 MR. MATYAS: So, you can go shopping for those services,
13 basically?
14 DR. SIMECKA: Well, we could tell them, you know, we
15 need this extra expertise, and out of those organizations,
16 they can pull almost any known expertise that you could think
17 of. So, it is really very cost effective to have that. We
18 don't have to go out and get another contract and et cetera,
19 et cetera. So, we feel it's very efficient.
20 Yes, Larry?
21 MR. HAYES: I just wanted to add something to what Bill
22 said. One reason that it's so cost effective, we might need
23 a group of experts only for a short time period. The way the
24 program is set up, we can do that. We can go into one of the
25 labs of the USGS and get together a group of experts for a
1 month, two months, get what we need, and then we go on. And,
2 it saves the project from having to keep a larger expertise
3 base.
4 DR. SIMECKA: Any other questions?
5 (No response.)
6 DR. SIMECKA: Okay. I'd like to ask Dale Frasier to
7 come up and give you a presentation on how REECO operates.
8 MR. FRASIER: Good morning. I'm Dale Frasier, a general
9 manager of Reynolds Electrical & Engineering Company. Rey-
10 nolds Electrical & Engineering Company, better known as
11 REECO, is a prime management and operating contractor to the
12 U.S. Department of Energy's Nevada field office. Our primary
13 mission is to support this nation's nuclear weapons testing
14 program and other programs on the Nevada Test Site and Tono-
15 pah Test Range. We presently have approximately 3800
16 employees, about half of which are craft people.
17 The major functions that we perform for the DOE
18 consists of construction. That would be both test construc-
19 tion for nuclear experiments and permanent facility construc-
20 tion. We perform virtually all the mining, drilling, heavy
21 equipment operations, fleet operations, utility and facility
22 maintenance, communications, power distribution, supply and
23 property management, housing and feeding, plant engineering,
24 medical operations, fire protection, health protection--
25 that's both health, physics, and industrial hygiene--waste
operations, and environmental management.

We're organized as follows. I have seven line divisions that report to me, as well as my legal staff and several other administrative functions. As Bill said, we've been designated the constructor on the Yucca Mountain Project and we do that through a division called the Yucca Mountain Project Division headed up by Bob Pritchett over here. Up to this point, Bob has gotten most of his construction support through matrix from other REECO organizations because we haven't had a sustained construction program to date.

A little bit of a historical data about REECO. We've been a prime management and operating contractor to the DOE and its successor agencies since 1952 beginning with the AEC and then ERDA and later DOE. So, we have about 40 years of experience supporting testing programs in a fairly highly regulated environment. We've been working side-by-side with scientists for the full 40 years we've been here. We presently have an NRC approved QA plan for the Yucca Mountain Project.

We've traditionally been a signatory with labor unions for craft workers for our entire 40 year history. Between 1952 and 1965, we used the Las Vegas area, what we call, master labor agreements. These are agreements that are negotiated by employer associations in Las Vegas like the Associated General Contractors, National Electrical Con-
tractors, and so forth. Then, in 1965, we decided to break away from the employer association downtown and we negotiated our own project labor agreements. We presently have 26 labor agreements, 14 of which cover the construction work or the Davis-Bacon work and we have 10 maintenance agreements. And, we have two other agreements, one with the culinary union to provide housing and feeding support and one with the Teamsters to provide firefighters.

One might ask why have labor agreements, why have agreements with labor unions? And, there are some pros and cons and some benefits and some drawbacks probably. But, at least from my perception, I think the benefits to having labor agreements is it's a damn good source of supply for craftsmen. And, my experience says that generally your union craft people are more specifically qualified than non-union workers. If you want a dozer operator or a blade operator, whatever, generally the guy you get out of the hall is going to be more qualified than a non-union worker. That's what my experience tells me. Also, the labor agreements we have enables us to increase our work force rapidly. They have a good pool of people.

There are several drawbacks in having union agreements. One is that there are some restrictive work practices and that would primarily be craft jurisdiction. And, what that really means is you're not going to have a guy that's
going to be a painter one day, a tunnel worker the next day, an electrician the next day, and a crane operator the next day. They have specific jurisdictions. Another potential drawback is occasionally when dealing with unions and union agreements, you could have a work stoppage. This has not been a major problem for us for a good many years. We've only had two of them since 1970 and they were both at contract negotiation time. Other than that, we've had no work stoppage, at all, in 20 years.

DR. CANTLON: How long?

MR. FRASIER: 20 years.

DR. CANTLON: No, how long was the stoppage?

MR. FRASIER: One of them was about 90 days, the other shorter.

DR. LANGMUIR: You didn't mention cost as a drawback. Is there a cost factor that should be listed as drawback, as well?

MR. FRASIER: I will get to that a little further down-stream, if I may.

When I talked about our ability to build up rapidly by virtue of having labor agreements, this is our workforce history over our 40 years here. And, as our program--

MR. GERTZ: Move it over a little to the scale? No, the viewgraph.

MR. FRASIER: Excuse me. Does that do it, Carl?
MR. GERTZ: Yeah.

MR. FRASIER: So, those are thousands on the vertical scale and the years.

So, as you can see, as our programs have changed over the years, we've had to rapidly increase, rapidly decrease. 1961, when we had a rapid buildup of almost 5,000 people, it was after the Russians broke the moratorium and President Kennedy put us back in the nuclear weapons testing business. So, we are able to adjust pretty rapidly, primarily, by virtue of having labor agreements in place.

When I kind of look at our project labor agreements versus the master labor agreements downtown, I believe that ours are generally more favorable to the employer. In the case of wage rates, for instance, operating engineers which will play a big role in the site characterization phase, our rates are about $3.50 an hour lower than the master labor agreements in the Las Vegas area. Our tunnel workers are about 5.25 an hour less than compared to the California rates which is our closest comparison for tunnel workers. Not much tunnel work done in southern Nevada except for the Nevada Test Site.

Subsistence rates, subsistence is a rate given each employee each day to travel to a remote location. We pay between $5.00 and $7.50 a day depending on the reporting coordinate on the test site. Similar rates for similar
distances under the master labor agreement runs between $25.00 and $30.00 per day. This is a little misleading because in addition to the $5.00 and $7.50, we also provide subsidized transportation and subsidized housing and feeding which tends to close that up considerably.

I think work rules which are very important in union agreements, I think ours are generally more favorable than the Las Vegas agreements. And, I'll give you one example. I see John Haslam from the operating engineers here today. We're in the midst of negotiating 24 of our labor agreements now. And, in our negotiation with the operating engineer, one of the things that we figured was a very uneconomic practice was the requirement to have a compressor operator on compressors of over 900 cubic feet per minute. You traditionally use compressed air in tunnel work and on drilling. We were able to negotiate that requirement out in this negotiation. So, that requirement goes away April 1 and, for instance, on a drill rig where you've got a four or five man crew, one of which is a compressor operator, that will cut the direct labor cost by 20 or 25%. So, we're continually working on these, and with our relationships with the unions here, we've been able to make a lot of those bad restrictive practices go away. On balance, I would have to say that our relationship with unions has been pretty darn good.
Your question relative to price somewhat relates to wage rates. And, I'll say this, that the construction hourly rates including the fringe package would be the same for non-union workers as for union workers for Federally funded construction work by virtue of the Davis-Bacon Act. And, essentially, what the Act says is that on Federally funded work the contractor must pay the prevailing rate of that area. And, our REECO construction rates actually set the prevailing rates on the Nevada Test Site including the Yucca Mountain Project. I don't know if that's responsive to your question.

Relative to the construction support that REECO has supplied to the project to date, the Yucca Mountain Project has really not sustained a continuous construction program. We've had a lot of short duration jobs building roads, drill pads, things like that. Nothing very sustained. So, most of that construction support has been matrix from other REECO departments. Bob hasn't really built up to having a construction cadre just yet, but he will be shortly. I do believe that the matrix construction support has been responsive and cost effective and I'll just give you one little example here. Bob periodically has to call for equipment and equipment operators out of other departments to build these roads and these drill pads. I'll just take an example; a 631 Cat scraper fully operated and maintained and
1 supervised has cost the project approximately $60.00 per
2 hour. You take that same 631 scraper from an outside con-
3 tractor. The outside contractor would have to realize
4 revenues of $150.00 to $180.00 per hour to come out. A D-10
5 dozer fully operated and maintained furnished to Bob from
6 another department is costing $60.00 an hour. The comparable
7 rate from a contractor on the outside would be $200.00 to
8 $220.00. The big difference here is the project has not had
9 to pay equipment ownership costs. On the Nevada Test Site,
10 we generally on the weapons side buy equipment with capital
11 equipment budgets. That's considered a sunk cost and those
12 ownership costs do not find their way to the individual item
13 of work. So, that is the biggest difference. So, from this
14 respect, I think the project has gotten a very good deal.
15 
16 And, this just is a slide showing how I derived
17 those rates that the other contractors would have to realize
18 to come out. And, basically, it was from Cashman Equipment
19 here in Las Vegas who is the Caterpillar dealer. They ran me
20 a computer run out on this. A D-10 dozer would have to rea-
21 lize $198.00 an hour; a 631, $177.00 an hour. Another con-
22 tractor in town gave me some numbers of his. A D-10 dozer,
23 $212.00 to $222.00 per hour; 631 scraper, $150.00 to $160.00
24 an hour. That's the basis of my numbers from the outside
25 contractor.
26 
27 There's been lots of questions over how REECO
1 burdens up its labor rates. In other words, what are the
2 adders that we put on labor for overhead, indirect burden,
3 and so forth? We start with our direct hourly rate here at
4 the bottom and that is the rate of the individual craftsman
5 and it's the amount he gets on his check with no fringes.
6 It's just if his paycheck amount is $20.00 an hour, that's
7 the only thing we charge as direct labor. It would be the
8 direct craft labor including his foremen.
9 On top of that, we put a factor that we call labor
10 load. We apply that indirectly. That would include such
11 things as fringe benefits, payroll taxes, insurance, state
12 industrial insurance, department manager, supervisors,
13 engineers, clerical, and so forth, office supplies, small
14 tools, those sorts of things. We call that all labor load
15 that we apply to direct labor.
16 Then, on top of that, we apply a load that we call
17 G&A, general and administrative. The includes the allocation
18 for general management. It includes our fees; legal, labor
19 relations, accounting, those sorts of general and administra-
20 tive kinds of functions.
21 DR. CANTLON: What sort of percent are we talking about?
22 MR. FRASIER: Next slide.
23 DR. CANTLON: Okay.
24 MR. FRASIER: I'll just take that dozer operator, for
25 instance. Start at the top, his direct rate is probably
$19.00 something an hour. We put a labor load on there and this will vary with the individual department. The labor load covers all those things I talked about; fringes, payroll taxes, insurance, supervision, light vehicles and all that. That can run anywhere from 80 to 100%. So, that would be another $20.00 or about 100%. On top of that, I apply a G&A of 16% on both direct and indirect labor which comes to $6.40 which gives me a total labor rate of $46.40. Then, on top of that on the weapons side of our business, we have what we call an equipment load. This equipment load represents the cost allocated to each department to pay the operations equipment department who maintains and fuels the equipment. So, for instance, if a department had a direct payroll for a month of $400,000 and he had rented $200,000 worth of equipment out of the operations equipment department, his load rate would be 50%.

When Bob gets his permanent construction cadre at Yucca Mountain, we'll cost much more discretely. The equivalent load will not be a load as such; it will be directly charged to the various pieces of work, whether it be a drill pad or road or whatever. We do this on the weapons side because it was very easy to do so and it lended itself very well to our accounting system there and it did away with a lot of equipment clerks and so forth.

DR. CANTLON: So, basically, you've got about a 200%
load, a factor of three, roughly; $20.00 an hour going up to
roughly $60.00 an hour?

MR. FRASIER: That is correct.

DR. CANTLON: Yeah.

MR. FRASIER: But, that includes equipment which is most
normally direct charge except on our weapons side where we do
this for ease.

DR. CANTLON: Right.

MR. FRASIER: So, it really goes to 46 if we just talk
about labor adders.

DR. CANTLON: Right. Now, since there is an interplay
between OCRWM's activity and the test site activity and if
one is looking ahead to a down-phasing in test site activity,
how sensitive will this calculation be to having to pick up
continued costs in a reduced area? This is after rise, not
fall.

MR. FRASIER: Not very dramatically, if anything,
because we will be cutting down on the other site. I think
what it says to me is we have a pretty good equipment fleet
on the NTS side. And, I've talked to DOE and they're willing
to let that equipment be rented out of the operations equip-
ment department to Bob's department at the normal rates that
we've been--for instance, a D-8 dozer would probably go for
about $320.00 per day or about $40.00 an hour and that $40.00
an hour includes fuel, oil, grease, repair parts, and repair
1 labor which is right on the industry standard. But, you
2 know, as you shrink things, some costs do tend to creep up.
3 DR. CANTLON: Indirect costs would creep up.
4 MR. GERTZ: Let me just put down a little perspective.
5 While there is a nine month moratorium, they're planning for
6 a comprehensive three year test program of five tests a year
7 which is about the average they've had over the last year or
8 two.
9 DR. CANTLON: The present administration is planning
10 that.
11 (Laughter.)
12 MR. GERTZ: That's true. I think there is a law on it,
13 too, but laws do get changed, as we all know, including this
14 law.
15 MR. FRASIER: A few months ago, Joe Lacombe, who is the
16 local manager of the Defense Nuclear Agency, asked me to
17 compare our labor adders with that of other contractors in
18 the commercial arena. And, it's a little hard to do because
19 every contractor calls things a little differently, whether
20 it be direct labor, indirect labor, overhead, burden, or
21 whatever. So, I made a stab at it. And, our operation is
22 field operations department, DOD in the middle here, and that
23 covers the full fiscal year '91. In that department, we do
24 about $60 million to $70 million of underground work per
25 year.
The one on the left—I'll call Contractor A—is a contractor friend I have in the midwest or in the middle west on a job that he did in the southeast which was about a $40 million job. And, Contractor B is a local general building contractor on a $20 million to $40 million range job. And, all I'm really trying to show here is the percentage of adders you put on your direct labor. And, I'll go back to kind of my discussion previously. Our direct labor wage which is really just only our craft labor; on top of that I put my labor load which was about the 100% for fringes, payroll taxes, insurance, light vehicles, supervision, and all that; and then, I put my 16% G&A on both. And, my adder brings that up to 134%.

Contractor A is a general engineering contractor, underground job in the southeast, calls things a little different. But, he calls burden here and I'll describe that later. And then, he calls field indirects and then G&A and then profit. So, his total mark-up on labor was more than mine.

Comparing against a general building contractor is a little tougher because a general building contractor will generally only do 10 to 20% of his work himself and subcontract the rest through several tiers of subcontractors. So, I picked and discussed it with a contractor here in town, picked the first tier down, and marked that up, and it came
1 up to 128% in terms of adders. And, it's probably really a
2 little greater than that because most of the work is done
3 beneath the first tier.
4 DR. CANTLON: How does that figure compare with your
5 prior slide where the percent was really in the order of 200?
6 Your labor load--
7 MR. FRASIER: This has no equipment.
8 DR. CANTLON: Oh.
9 MR. FRASIER: This is just purely my labor adder. And,
10 since most people charge equipment directly, I did not
11 bastardize this with equipment.
12 DR. CANTLON: Gotcha.
13 MR. FRASIER: My profit is within the G&A here. It's
14 called "fee" to us.
15 And, this just describes again a little better
16 between the one heavy contractor and us what's in each one of
17 these categories called direct labor, burden, field
18 indirects, G&A. It just describes some of the things I've
19 previously described.
20 MR. GERTZ: Dale, I don't want to get specific about
21 your fee, but certainly the DOE guidelines for fee for--is
22 significantly less than fee in the private sector right now.
23 MR. FRASIER: You noticed.
24 (Laughter.)
25 MR. GERTZ: Let's be honest, their risk is significantly
less, too. It's a cross contract and they don't have to invest.

MR. FRASIER: Which kind of leads me up to the next slide. There's been a lot of discussion as to whether the construction, mining, drilling activities, should be--what kind of contracting should be used? I think I heard that mentioned a little this morning. And, so I just listed some of my thoughts as to what might work and what might work well. So, I've kind of taken some advantages and disadvantages that I consider to be valid for cost reimbursable versus fixed price contract. And, under cost reimbursable, I believe this is a more flexible arrangement. You can pretty well start, stop, and modify the operation with relative ease. Less risk involved here which dictates, as Carl talked about, less fee. It's been my experience that your quality of the product done under this kind of contract is probably a dab higher than in the fixed price.

MR. MATYAS: Sir?

MR. FRASIER: Yeah?

MR. MATYAS: How do you do that? I mean, what's the motivation on the part of the employee? You just have a sharp--you have good quality control on the job?

MR. FRASIER: Well, that, plus it's a little different when you've having to make a buck every day on every item than being viewed a little broader in terms of the cost plus
1 award fee in my judgment.

2 MR. GERTZ: While we're talking about that, I think I've
3 talked to some of my colleagues at M-K and I think Jim can
4 verify this, but 20 years ago, major contractors like M-K
5 were doing maybe 80% of their work fixed price and 20%
6 negotiated. Today, they're doing 80% of their work negoti-
7 ated cost reimbursable and 20 fixed price. Why? Because the
8 client wants to pick people he knows, doesn't want to hassle
9 with them, and will get a better quality product in the long
10 run. And, I think that's a trend in private industry across
11 the nation; at least, for the M-Ks and the P-Ks of the world.
12 Clients are looking for people they can depend upon to carry
13 out their job.

14 DR. BARTHOLOMEW: Just a comment, Carl, on that that I'm
15 very familiar with that company, as well, and I think, no
16 doubt, what you say is true, but that's not necessarily
17 typical of all underground construction contractors. There
18 are many whose philosophies are more along traditional lines.
19 I don't mean to be argumentative about it, but--

20 MR. GERTZ: Okay. Particularly if you narrow it to
21 underground, you're probably correct. I was speaking of the
22 broader general construction, above-ground buildings, those
23 kind of things, for commercial suppliers like General Motors
24 and things like that. You're very well--I defer to your
25 thoughts on that.
DR. BARTHOLOMEW: It's a point.
MR. GERTZ: Sure.
MR. ROBERTSON: Let me make a comment on that if I would. It was referred to here, but I don't think many of you have much of an appreciation for the small amount of fees, that M&Os that are doing a fairly substantial annual amount of business, are. As an example, if you get into the $150 million a year range, you're talking about fees that are just a little over 2% on volume. Now, that's very small, but the thing that you need to understand is that that's the base fee. The award fee can double that amount. So, the incentive that is available to the contractor is enormously leveraged under the award fee criteria. And, so while it's a small amount of fee itself, the multiple is very large in the award fee structure. So, you have a very heavy incentive to produce, you know, to get an acceptable--
MR. FRASIER: I agree with you and I had a bullet there on that.
MR. ROBERTSON: Right.
MR. FRASIER: You've explained that very well. I think this kind of contracting lends itself very well to R&D and testing kinds of work like we'll be doing on Yucca Mountain because of the flexibility. And, the fee is dependent on performance. You're rated and the percentage of your fee pool you get is totally dictated by the performance point
rating given to you by the owner. Fixed price or unit price, you generally need a well-defined scope, design, and specification. It's a little less flexible. If you start impeding progress or making significant changes, you're going to pay a penalty. And, just the flop, I think the quality is a little better on the cost reimbursable. Higher risk, more mark-up. On the plus side, it provides competition which certainly may have a financial aspect to it. And, another thing, that they're generally not bound by the Department of Energy acquisition regulations and the Federal acquisition regulations like we, as the cost reimbursable, would be.

I guess if I had a comment, I would say it will take a combination of both types of contracts to do this program. You'd just the cost type contracts where flexibility is needed and/or scope or general or special conditions cannot be well-defined, and you'd use fixed price or unit price contracting when all conditions can be well-defined. As a matter of fact, we're getting ready to go out on the street right now to lend a fixed price contract to manufacture a couple hundred thousand yards of our first aggregates that are going to be needed. We're getting close to awarding a cost reimbursable type contract for the tunnel boring. So, I think it takes a combination of both to really have an effective program for a program like this.

And, Bill, that's about all I have.
DR. SIMECKA: Okay. Questions?

DR. CANTLON: All right. Any questions?

MR. SCOTT: Jim Scott with Raytheon on the cost estimating. Relative to what Dale pointed out on the cost adders, I see some of you taking notes. The construction estimate associated with the ESF is not based on the adders totally that Dale has pointed out. These are weapons program adders that Dale has described. The main difference is the 102% that's described here for weapons is not applied to the ESF. They were actually using the 65% figure.

As far as comparing contractors, this is a personal remark, REECO shows low, but what doesn't show up in the slide is the G&A as applied across labor material, as well as equipment rentals, where perhaps the contractor maybe applying all his mark-up straight to labor and not to the other categories.

MR. FRASIER: There's a mix on that kind of thing. Some do it--

MR. SCOTT: Yeah, it's a hard thing to compare. But, I thought the 65%--I noticed some people were writing down, I think, 102% and really the estimate uses 65%.

MR. FRASIER: Bob will be costing a little more directly with less loads than we do on the weapons side.

DR. CORDING: In that estimate, with 65%, what does that total? I mean, what part of the project is it and what does
What are we--

The 65% applies to the direct construction labor cost. The same way that Dale described the function of it, but it's 65.

For the subcontractors? Would the estimate for the subcontractors work? Is this what--

No. No, no. Subcontract costs with REECO gets a different mark-up. It's handled differently. These adders that were described are applied to REECO labor.

The only mark-up we would put on subcontract would be G&A and that could be anywhere from 2% up depending on the size of the--

Bill, did you have any more that you wanted to say?

(No response.)

Okay.

I just wanted, Dale, before you leave, looking at your comparison of the pros and cons of various kinds of commercial terms where you contrast the advantages and disadvantages of cost reimbursable work to fixed price work and then indicate that in your opinion a combination of both is probably best for this project, I think all of us in this room, regardless of our persuasions and past backgrounds, would recognize that from what's been said here in the last couple of days that the underground work is
1 undoubtedly going to have to be pursued on some kind of a
cost reimbursable basis as compared to a fixed price basis
where the contractor is going to carry all of the investment
on the job. The Government, essentially, is going to have to
bankroll the job. That doesn't necessarily mean that there
cannot be some elements of risk sharing introduced in that
through one type of arrangement that you may have had in
mind, but hasn't been discussed yet. And, that would be some
kind of a target estimate arrangement, particularly in tunnel
work or underground work where more definable objectives can
be more easily established and can be, you know, objectively
determined. That you either make the target or you don't
make the target, both with regards to time performance and as
regards to cost. And, that might be something that could be
considered. I'm not thinking so much insofar as REECO's
overall contract is concerned, but I'm thinking more in terms
of the subcontract work where you're talking about, after
all, 76,000 feet of underground work.

MR. FRASIER: And, I think we could do that very well.

We've--

REPORTER: Use the microphone.

MR. FRASIER: --time schedule and cost right into the
cost plus award fee evaluation process.

DR. BARTHOLOMEW: Well, by my understanding of the award
fee process--and, please, correct me if it's incorrect--it
1 does depend, does it not, more or less, on the subjective
2 judgment of a manager at some level that determines what in
3 his opinion the opinion of the performer has been and then
4 assigns a mark to it or a grade to it. Whereas, what I was
5 thinking of is something that's a little bit more--it's not
6 subjective. It's purely a question of attaining the target
7 or not attaining it which is a major type of thing.
8     MR. FRASIER: Our CPAF system is starting to mature now
9 and all of our priorities and objectives are pretty damn
10 objective right now. So, it's just not a matter of did you
11 do a good job or didn't you? There's a whole list of
12 criteria that says you either did or did not do a good job.
13     MR. GERTZ: In other words, we could put an award fee
14 criteria for a subcontractor as you average 50 feet a day or
15 75 feet a day over the period and you either did or you
16 didn't and you get so much more award fee for doing that or
17 not doing that. Or your costs were under, you know, $5,000
18 per foot or whatever. That can be incorporated into an award
19 fee structure. We're trying to be more objective in our
20 process of that.
21     MR. PRITCHETT: Bart, what we're trying to do with this
22 major subcontract for the tunnel boring--perhaps, you've had
23 an opportunity to look at the RFP, I'm not sure, but we--
24     DR. BARTHOLOMEW: I've looked at the outside of it.
25     MR. PRITCHETT: We've broken that up into two stages.
The first stage being a technical support type of activity to help us with constructability concerns and designery views and get their program ready in a work procedure and other procedural sets and get their quality assurance program established in compliance with ours.

Then, we're going into a stage two aspect of the subcontract which is the field implementation of the actual tunnel work. And, it's divided up into nine or 10--Tom, help me, is it 10 task orders--including the option shaft thing which we don't know about yet today. But, as we mature to field implementation and we've arranged these tasks which we hope will be compatible with the staged design process as the increments of the job come through the design shop, we'll negotiate each one of those tasks individually and uniquely based upon the criteria as it comes out. And, during that negotiating process, we hope to be able to develop as part of the cost plus award fee portion of the contract some very measurable parameters that we can uniquely judge the progress by and be able to measure it to try to remove as much of the arbitrariness, if that's a good word, out of it.

DR. BARTHOLOMEW: I think it's a good word. I take it from what you say that you regard that there's quite a little level of flexibility available before this thing gets cast in clay in that regard.

MR. PRITCHETT: Yes, sir. We maintain the option in our
request for proposal to either have our subcontractor do
these tasks or, depending upon future conditions that we may
not be able to anticipate right now, we may choose to do one
or more of those tasks ourselves.

DR. BARTHOLOMEW: Okay. I might make an additional
point that from what I've seen it seems to me that part of
your subcontractor's effort is conceived to be in terms of
technical support and assistance to the scientific testing
program to augment your efforts in that respect, as well. In
addition to purely--

MR. PRITCHETT: During the implementation stage, yes.

DR. BARTHOLOMEW: Yeah. In addition to purely driving
tunnel and also, as you pointed out, part of their scope is
in participation and technical support services to help you
in the initial stages of the program and then planning their
work.

MR. PRITCHETT: Yes, sir.

DR. BARTHOLOMEW: It seems to me that it might be--and,
maybe this would be accommodated by the fact that you've
broken this thing up into packages, but the evaluation
criteria, I think, have to be distinctly different for those
two different kinds of activities.

MR. PRITCHETT: Yes, sir.

DR. BARTHOLOMEW: One is pretty much going to be a
question of how good a job you think you're doing helping you
1 and the other is they either got there by a certain date or
2 they didn't. You know, they spent so much money or they
3 didn't.
4     MR. PRITCHETT: Yeah.
5     DR. BARTHOLOMEW: You've got the flexibility to reflect
6 that.
7     MR. PRITCHETT: There's a different approach required
8 for the two different stages of the contract.
9     DR. BARTHOLOMEW: And, you're saying you can accommodate
10 that.
11     MR. PRITCHETT: We think so, yes, sir.
12     DR. BARTHOLOMEW: Okay.
13     MR. GERTZ: In fact, Bart, just to give you a feeling, in
14 our existing award fees we accommodate that right now.
15 Some other are very subjective; you know, are you doing a
16 good job managing? And, the others are did you deliver
17 Report X or Report Y? Did you build this warehouse? Did you
18 do that? So, we combine both of those kind of approaches
19 into the overall award fee plan for the period. I mean,
20 we're doing it now; we're not doing it maybe as good as we
21 could do, but we're striving to be more objective.
22     MR. ALLAN: Yes. This is a lovely conversation, but I
23 strongly object. I've had the responsibility of managing a
24 large long-term incentive fee, cost reimbursable contract.
25 Mr. Cronin shared some of that with me. And, I would point
1 out firstly that it puts you into exactly the same mode of
2 contract administration as administering a fixed price con-
3 tract. Every change, every deviation has to be analyzed and
4 tracked exactly like a fixed price contract. So, your scope
5 of work has to be, to be successful, equally well-defined as
6 it would be to do fixed price work.
7     Now, as Bob says, there may be some very broad area
8 where that could be applied in the various work package
9 process as we work our way along. But, as an overall con-
10 cept, one of the things that I was most satisfied about to
11 see when I got to Carl's project was the fact that they had
12 chosen a cost reimbursable contract. I can't imagine doing
13 this any other way successfully and with certainly a minimal
14 of effort. I just can't say strongly enough that when you do
15 that, you have to have a defined program. You can't be
16 interfering with the program. When you put that contractor
17 on an incentive fee, he has to be allowed to go do his thing.
18     And, we all sat here all day yesterday and listened
19 to the degrees of uncertainties, of questions yet to be
20 answered over a very broad specter, and so I can't say it any
21 better than to say in summary, I object. Mr. Cronin, would
22 you dispute that?
23     MR. PRITCHETT: I'm not sure what you're objecting to,
24 Jim.
25     MR. ALLAN: My objection is if you're going to do that,
1 you might as well do it fixed price, Bob. You're going to
2 contract administer yourself in excess of any potential
3 benefit from the result in my opinion.
4 MR. GERTZ: But, I think what we're trying to strive--
5 and I think Jim will agree because I know M-K has done award
6 fee contracts in other DOE things--is we're trying to strive
7 for not making it a contract administrator's nightmare to
8 keep track of the changes so we can keep track of the
9 incentive fee. We're trying to provide incentives to a con-
10 tractor and maintain flexibility. And, I think a flexible
11 approach, the award fee process can do that; provide incen-
12 tives, but maintain flexibility.
13 DR. BARTHOLOMEW: What he's saying though, Carl, is on
14 those parts of the scope where you're going to fix some kind
15 of a target and what the contractor realizes in terms of his
16 net gain is going to be his ability to get there by a certain
17 date or to get there below a certain cost where he's going to
18 get some benefit from that. It's a matter of great impor-
19 tance to him how many roadblocks and impediments--
20 MR. GERTZ: And, how many changes we make to him along
21 the way because--
22 DR. BARTHOLOMEW: --and how many times you change the
23 plans and specs along the route.
24 MR. GERTZ: Absolutely.
25 DR. BARTHOLOMEW: I think that's what he's saying and
that you've got to track that in exactly the same way you do
as if it were a hard money contract.

MR. GERTZ: Okay. You absolutely do and I won't--I
guess I--

MR. PRITCHETT: Jim, I don't think I said that we--
MR. ALLAN: I'm sorry?

MR. PRITCHETT: I don't think I said that we were going
to do that or that we weren't going to do that.

MR. ALLAN: Weren't going to do what?

MR. PRITCHETT: What you're objecting to.

MR. ALLAN: Okay, good.

MR. GERTZ: I believe at least the concept--

MR. PRITCHETT: I don't think I said that.

MR. GERTZ: --implement is a flexible approach that has
incentives to it. If you give a contractor an award fee
criteria that says 2,000 feet in some days, if you start
messing with it, then you need to adjust your award fee
evaluation of that. That's all I'm saying.

MR. FRASIER: And, you don't get penalized for it.

MR. GERTZ: You don't penalize the guy if he didn't make
it if it's your fault because you're grading yourself. And,
in all due respect though, the award fee process has to be
managed appropriately. I was on the other side as a con-
tractor and, as a manager on the other side, we thought our
client was so unfair that we refused to participate in award
fee meetings or anything else and just went and did our work and said I'm not going to waste time on award fee because it's not fair and we'll just go do our job and give us whatever you think. And, we don't want to develop into that kind of an acrimonious relationship, at all. It has to be a combination. So, what Bart says is absolutely true. If you give them a target and then you mess with that target, you'd better compensate them accordingly like you would in a change control process.

DR. BARTHOLOMEW: Well, yeah, it's essentially a question of making a change order or adjustment to the target, a different time or price and, you know, what's new in life.

MR. GERTZ: There's going to be changes--

DR. BARTHOLOMEW: I ran a target estimate contract once on a major piece of work, and speaking just from a standpoint of a contractor, we had as many battles with the owner over changes as we did as if the contract had been a hard money contract.

MR. ALLAN: That's my point.

MR. GERTZ: That's Jim's point. I don't want too many of those battles, but I do want to have an incentive, too.

DR. BARTHOLOMEW: Well, but they're going to be there. I think you've got to recognize them and identify them the best you can.

MR. GERTZ: We have them right now with our four award
fee contractors even though it's not specifically under-
ground.

MR. FRASIER: But, it works.

MR. GERTZ: But, it works. I think it's an overall
incentive.

DR. CORDING: I'm sure there are many items that are
undefined and there's going to be a lot of changes on it and
there also is opportunities, it seems, in organizing the
portions of the project. For example, tunneling through a
major part of the repository, there may be some opportunity
there to minimize interference. And, even with--I say, the
interference due to other operations. And, it would seem to
me that there is opportunity there to utilize some sort of--
something a little bit better defined to utilize something
that would give incentive for efficient operation, costs, and
schedule.

MR. GERTZ: We totally agree with you--

DR. CORDING: The nature of these operations are such
that--the TBM's are such that you can get a wide range of
progress depending on what the interests are of the con-
tractor in achieving it. I'm interested in the conversation
here that you're making and I'd like to get a little bit-- go
a little further with the item. It seems to me that if you
don't put costs and schedule into this award fee or into some
sort of incentive, then what is the award fee to be composed
of? If it's, you know, how well you're keeping up the paper chain, that may be important, but it's not—you've got to make the progress, also.

MR. GERTZ: And, our award fees are very multi-faceted. It's safety of operations, it's complying with environmental rules. In fact, there's a DOE order that at one time 50% of the award fee had to be on safety and environment, not on production or cost. No matter how good you did in production or cost, if you weren't taking care of safety and environment, you didn't get the award fee. And, so cost and schedule is part of our award fee, technical excellence, responsiveness to the customer, and you sort out two or three pages of what you're asking a contractor to do and weight it and provide milestones and/or guidelines for them.

DR. BARTHOLOMEW: Is that what you refer to as level of effort when you used that term a little earlier?

MR. GERTZ: No, level of effort is where in our cost schedule control system you have eight people in a procurement department and you can't quite measure progress. They're supporting you. So, that's a level of effort activity. As opposed to eight people producing tunnels or something you can measure. You get so much credit for 10 feet of tunnel, 20 feet of tunnel, 30 feet of tunnel.

DR. BARTHOLOMEW: Well, no, that's what I meant. I'm talking about some of—you said multi-faceted. These facets
1 that you don't really--you can't measure in terms of a certain objective, amount of production per unit of time. That really does amount to level of effort, does it not?

4 MR. GERTZ: Yeah, it certainly does. You have four safety engineers or whatever. So, you have to subjectively evaluate how they're doing. Now, if you have a lot of accidents, that becomes an objective evaluation for man hour used. So, you combine some of the two. How well is their procurement department doing? Well, you know, you look at that.

11 DR. CORDING: One other item I'm interested in hearing your perspectives on is the award fee as a unilateral decision making process. I'm wondering to what extent that would be used in this subcontract and is there some other opportunity for negotiation with a contractor or--and, of course, with incentive fees sometimes the negotiations take place as you select your contractor and the process of the award of the contract itself. So, to what extent is this other approach applicable? What's your feeling on that, the unilateral aspects versus a negotiated type of operation?

21 MR. GERTZ: I'll defer to Bob because that procurement is still under--in process and I don't know how much--and I'm not very familiar with it because I'm trying to stay away from it. I don't know what Bob can talk about because we have, I think, three teams we're still negotiating with.
MR. PRITCHETT: Yeah. Is your question, Ed, how are we evaluating the proposals that we've received?

DR. CORDING: It's not directed at that quite so much, although it might apply to that. But, I guess, my question is how would you determine with a subcontractor the incentives or the award aspects to the fee? How do you work that out with the contractor and develop an understanding on that? Is it going to be a unilateral process or is it a process where you negotiate with a contractor? At what stage do you do it?

MR. FRASIER: I'll answer that, Ed. What we traditionally do and it's pretty well governed by the DEAR's, is you'll sit down--

MR. GERTZ: DEAR's is an acronym from DOE acquisition--

MR. FRASIER: Yeah. You'll sit down with the contractor. You'll negotiate what's called a fee base and that's a dollar volume of work. And, you'll convert that to what we used to call fixed fee. And then, if you're going to award fee, you'll get your multiplier for award fee. You'll wind up with a pool called an awards pool. And then, you'll probably negotiate by tacking maybe 10 or 20% of that on a base fee which is the old fixed fee type which leaves 80% of the pool at risk for him. And, depending on what grade he gets, once you've established the dollar value of that pool, the contractor would be rated either quarterly or semi-
annually on a scale. If you give him 80 performance points which is maybe in the satisfactory range, that means for that period he gets 50% of the pool. It's pretty well structured.

MR. GERTZ: Let me follow up with another thing that Bob had said and maybe you didn't pick up on. I think he said, as they negotiate certain packages of work, they then are going to negotiate an award fee performance for that package of work. We do it now on a time frame. We say for the next six months, we'd like to see X, Y, and Z products, we'd like continued safety and continued environmental protection performance, good QA, and we'd like some other products in another area. And then, we evaluate them in that six months and set up another--at the end of six months, we say here's your charge, so to speak, for the next period.

DR. NORTH: I'd like to ask essentially the same question that I think Ed Cording has been putting to you, but make it specific to the study plans. How is it that the award fee structure will be arranged so that you have an incentive to do good research as the opportunity may arise? What concerns me, for example, is if you have award fee criteria of so many feet per day of progress on the drift or keeping the costs below some limit and then as the construction of ESF is proceeding and we find some particularly interesting geology or perched water and the scientists want to stop and study it for good reason, that the contractor
1 doesn't have a very strong incentive. Well, let's keep going 2 making so many feet per day. Stopping will cost us a great 3 deal of money. There ought to be an incentive to support 4 good scientific research when the occasion arises without 5 lots of management meetings.
6 MR. GERTZ: Yeah, I think that's very appropriate. The 7 only reason we're doing any of that is for the scientists. 8 So, if the scientists say stop, we're going to stop. We'll 9 then make an appropriate adjustment to whatever award fee 10 target we had with that guy.
11 DR. NORTH: So, you can assure me that that structure is 12 in place as opposed to the kind of thing that James Allan was 13 describing where it turns out to be very, very difficult to 14 operate under that circumstance because some of the scien-
15 tific reasons for stopping or slowing down haven't been 16 thought through in advance and aren't in the letter of the 17 agreement?
18 MR. GERTZ: Yeah, as we pointed out earlier, I think, we 19 have a Federal responsibility to manage the project. The 20 project is not to dig tunnels. The project is to evaluate 21 the mountain. So, when the scientists say let's stop and 22 evaluate, we stop and evaluate. Then, we'll have to make 23 appropriate adjustments if that affected an award fee target 24 for that time. And, that's not unlike we do now. If I tell 25 the M&O to get this product out in six months and then I say,
hey, wait, we have a new law, we have to pull you off this product, you have to work on those standards, or something like that, and he says, well, I can't do the product you asked, and I'd say we recognize that, we will not evaluate you on that product.

MR. PRITCHETT: That has to be part of the equation in coming to a mutual understanding with the subcontractor on the next package of work.

MR. HAYES: Where the question you asked is being addressed. In the test planing packages and the job packages, we are putting in there for the construction people down time to do just what you're talking about. So, that will be part of the official formal test planing package process.

DR. NORTH: But, is that an allocation that has some flexibility in it or does it wind up being potentially a hard constraint some time in the future? So many hours of down time to do certain types of experiments, for example?

MR. HAYES: That's exactly how we're putting in--we're making some estimates based on what we think we may encounter, say, with perched water, say, with running across faults, and we're putting in some time to deal with those issues, as well as we're putting in a little bit of extra time to deal with unanticipated events that we might run into. So, the time is there and it would not count against
1 the construction people.
2 MR. GERTZ: But, if we need more time, we'll take it. I
3 mean, that's the management way of doing--
4 DR. NORTH: Good. And, you have a lot doing that with-
5 out getting into gridlock.
6 MR. GERTZ: Yeah. You have to estimate in order to
7 plan. So, you give it your best estimate, as Larry said.
8 MR. HAYES: Without penalizing the contractor.
9 MR. GERTZ: Yeah. First of all, that's why he's a cost
10 contractor. So, you're not going to penalize him. Secondly,
11 though, every contractor is a profit-making entity normally.
12 So, you don't want to penalize his opportunity to make prof-
13 it. You need just to be flexible.
14 DR. NORTH: Let me raise another issue that I think may
15 be related and this is the question of craft jurisdiction.
16 If some unusual things happen with respect to the science as
17 you're going along and suddenly you need to do some operation
18 that had not been anticipated as part of the base plan, do
19 you have a problem essentially from the craft jurisdictions
20 that either require you to keep people there in case of need
21 who are of the right craft or it's a violation of the rules
22 if some scientist whose not part of the union does something
23 that facilitates getting on with both the construction and
24 the scientific experiments? Are there problems of that kind
25 that would be useful for us to understand?
MR. FRASIER: I think you're going to have to explain exactly a little more what you mean.

MR. GERTZ: Let me give you a couple of examples though, Warner. Sure, you're going to have problems with that. We can't have scientists running bulldozers to look at a trench. They're not qualified to do that. On the other hand, with John Haslam—I don't know if he's here right now—and Bruce Crowe's excavation, smaller excavations, we worked out an agreement that the operating engineers said, no, that is a scientific operation and a scientific person can dig in a small amount and do what he needs to do. Digging a trench, that's something different. Digging a soil pit, that's probably a scientific thing. So, that's part of a negotiated process you work out with those crafts. I would assume as you're doing a tunnel—

DR. CANTLON: We've got four people on microphones here now. Let's just go counter clockwise here. Go ahead?

MR. TRENKLE: I'm with the labor unions in Las Vegas. I'm a business agent for them. I just want to reflect on some of Dale's comments. We're happy to see REECo was chosen as the constructor because we have a very good working relationship with REECo not only just as craftspeople, we represent miners and construction and maintenance labors out there. But, our people are also involved in their safety program. Some of
our people have come up through the ranks and they're in upper supervision with Reynolds Electrical now. As far as craft jurisdictional guidelines like you just mentioned, we have very few problems in that area. We generally work it out. We have a good relationship with Mr. Gertz and Mr. Frasier, both, and very few problems in that area.

As Dale mentioned, the labor rates on the Nevada Test Site are generally less than the Las Vegas area, northern California, southern California. That's just through negotiations. We don't foresee any labor problems on the Nevada Test Site or the Yucca Mountain Project. We're currently bargaining on some of our contracts with REECo right now. Some of us have signed off. So, we're very anxious to see the project go on and, like I said again, we're glad to see REECo involved in it because their safety program is excellent.

MR. HASLAM: Yes, my name was brought up a few times today. I am John Haslam and I am with the operating engineers. And, what Carl said with scientific studies and there's situations where the projects stop because the scientists want to look at things, this has been going on right in Trench 14. Our backhoe operators have been doing that work. When the scientists and geologists ask us to stop, they wait until they're ready to go again, I guess is the best way to
MR. GERTZ: Let me just go on. That part of the training program, the craftsmen who go to our QA training program, to assure they can be responsive to the QA program.

MR. HASLAM: And, the other thing I'd like to add, as far as quality people and that, we have apprenticeship programs in all the different areas out there not only with equipment operators, surveyors, machinists, oil well drillers—we have a program in the oil industry that's the best in the country. As far as safety, I want to add that Reynolds Electrical & Engineering has the Blue Safety Committee which is excellent. I've sat in on their meetings. I've been invited to them and I've went in on their meetings when I wasn't invited and I'm proud to say that our people are part of that program and that program is put together with workers that are working at the Nevada Test Site and they do participate and they do get results.

So, if there's any questions you want to know about the operating engineers, I'd be glad to answer them. Thank you.

MR. WILDER: I want to make a couple of comments. One is based on our experience at the spent fuel test at Climax which I think is a pretty good example of the kinds of work that we will be doing at Yucca Mountain. And, experience there was that, yes, there were times when, because it was in
a construction phase, it was maybe a little bit painful to get things stopped, but we were able to by discussing with the contractor, with REECo, what the needs were to get the scientific needs met, to slow down the construction at times. And, so I think that it can work. But, critical to that is having the scientists working intimately with REECo and the people doing the work.

And, one of the cautions, I guess, or a note of caution that I would throw out is that I note on the schedule that there are a lot of construction activities that are going to be ongoing to get ready to do scientific work. One example is we're going to need a bunch of boreholes drilled. If those boreholes are being drilled at a time when the scientists are not given access underground because we don't have two accesses and so forth, then I think it's going to be a lot more cumbersome than if we can work directly with the people doing the construction.

And, secondly, I wanted to just address the issue of whether or not you have better skills sometimes being brought to bear. I think, in general, that probably is true. We had very good working relationships. There were a couple of times when it was a little bit painful and I guess, specifically, I look at the drilling. Because they come out of an operating engineer pool, there were some times when, frankly, I felt that the people that were "drillers" were not
as expert as others, but we were able to work the problem and
they brought the people on board that needed to solve the
problem. So, in general, I think it's worked fairly well.

MR. GERTZ: Dale, you were speaking though of the Climax
experience, specifically, 10 years ago.

MR. WILDER: That's correct.

MR. GERTZ: Things have changed in 10 years in this
program, too.

MR. WILDER: Well, Climax and G-Tunnel.

MR. GERTZ: And, G-Tunnel.

MR. WILDER: And, you have to admit we were really stuck
at G-Tunnel for a while.

MR. GERTZ: No doubt about it, we were, but once--

DR. CANTLON: Dale Foust and then we'll go to Hugh.

MR. FOUST: I wanted to point out that there's a some
time overlook provision of an award fee contract that applies
to the kinds of issues that I think Warner and others have
brought up. And, that is a rollover provision which says
that you give the contractor a second shot at the unawarded
fee. And, that means that at the end of a contract period,
you can look at the overall or the integral of the work that
they did, considering the conditions under which they did
that work, and if these unanticipated scientific delays may
have caused them to get a lower grade, strictly looking at
the award fee plan that you had negotiated, you can recompen-
sate them for work well done under those conditions. And, I just think that's something I wanted to bring to your attention as being very applicable to this case.

DR. CANTLON: Thank you.

Hugh?

MR. CRONIN: Carl, for your next fiscal year here, I was just curious. We're talking about all this award fee business and I guess that's directed primarily to the construction contractor?

MR. GERTZ: No, it's also directed to SAIC and the M&O.

MR. CRONIN: That's exactly my question. How much of the work or how much of the dollars you're going to spend in the next year is direct cost? Can you give us some rough percentages? Direct cost versus some type of a fixed price contract either lump sum or unit price versus cost plus a flat fee versus a cost plus an award fee. Maybe four categories of breakdown of all the fiscal expenses?

MR. GERTZ: Yeah, but it will take a little time to do it. But, offhand, the laboratory work--and I guess speaking now, we must have about 25--20 at your place, Larry, or something and 10 at the other labs--about 50 million is at the laboratories and that's strictly cost reimbursable. We provide an evaluation of how they're doing to keep their contract, but there's no fee on it. So, there's no fee; it's just cost reimbursable with the national laboratories. So,
that's about 50 million. Oh, 62, okay, good.

The M&O contractor and SAIC have about 80 million
of work and that's under award fee. REECO, what's your
number next year? 52 million and that's under award fee.
Raytheon has got a small amount, 10 million under award fee.
And, I'm trying to see--I think that covers it.

MR. CRONIN: That's about 300.

MR. GERTZ: Pardon me?

MR. CRONIN: That's about 300.

MR. GERTZ: 300 million? It shouldn't be that high.

MR. CRONIN: No, 200. I'm sorry, 200.

MR. GERTZ: Yeah. There's 40 more spread across some-
where that I was not able to give you.

MR. CRONIN: So, the answer, I guess, the bulk of the
work is under award fee?

MR. GERTZ: That's correct. Some of REECo's contracts
will be fixed price. So, not only is their 50 million under
award fee, part of that 50 million, they will subcontract
like the aggregate as fixed price. And, I don't have a
number of how much of their award fee portion is also going
to be a fixed price contract.

MR. CRONIN: Can you give us an answer on that, Bob?

MR. PRITCHETT: I don't have those numbers in my head.

MR. CRONIN: I guess Dale is not in the room here, but
he mentioned--
MR. GERTZ: We'll get an estimate. It's not much next year.

MR. CRONIN: Dale mentioned something before and I didn't really understand it. At first, he mentioned that a typical contract in the $150 million a year range would have a 2% base fee and a 2% award fee.

MR. PRITCHETT: I think that was Robby Robertson.

MR. CRONIN: Oh, was it? Okay. Robby, maybe, you could--

MR. ROBERTSON: Yeah, let me respond to that, yeah. And, these are available, by the way. I can get you a chart. The fees are plotted just like a tax table only they are lower percentages. The higher the annual volume, the higher the base—the lower the base fee. So, when I used a number like 150 million, it is approximately a 2% base fee.

MR. CRONIN: And, 2% award fee, was that--

MR. ROBERTSON: Pardon?

MR. CRONIN: Was that your statement?

MR. ROBERTSON: No. And then, there's a 2% upper on the award fee and a 1% downer. In other words, at a fixed—at a fee of about 70—a grade of about 70%, you get the 2%, and then as you go on up to 95, you get the other 2%. If you go below 75 and go down to 55, I believe is the right number, you get only 1%. So, there's a stick and a carrot, if you will, built into that. Now, that's for M&O contractors.
The subcontract that REECO is going to let isn't an M&O subcontract. I mean, that will be a separate contract negotiable within the DEARs. That could be all the way from a zero base fee, 100% award fee contract, to any range that you wanted to depending on what you wanted to incentivize. So, I think you need to understand that you've got a great deal of flexibility within the upper limits of what fee can be paid on a Federal contract under the DEARs. But, he has the opportunity to make it 100% award fee if he and the contractor with whom he is negotiating is so amenable.

There's another question that I really want to direct to Dale, I guess, as to whether it's been thought about yet. And, again, I'm encouraged about the breaking it up into packages because I think that gives you a great deal more flexibility for the different phases of what you're doing. But, there is an allowability exercise under the DEARs and the FARs that allow for cost incentive contracts, as well. In which case, if you have set up--this is under a cost reimbursable type contract even--in which you have established a cost baseline or cost criteria against which you can judge the subcontractor, and then on a ratio typically of 20/80, the contractor gets 20% of the cost savings that occur. The Government then would, of course, incur an 80% saving of that cost. But, the contractor then is incentivized because he has 20% of those costs which can accrue to
him, having all of those never exceed, of course, the statutory limit on the fee on the upper end. But, in any event, those are mechanisms that can also be applied and, in particular, with this particular kind of project where certain cost elements could be fairly well-defined, I suspect, in certain of the operations. It's something that seems to me we ought to think about at some point. I don't know whether you've examined that, but I just raise that as a point.

DR. CANTLON: Could we get Dale to respond and then we'll take a 15 minute break?

MR. FRASIER: Yes, sir. We have looked at that. Presently, we're not under the accountability rule part of the DEAR. I expect we will be come October 1, next year. And, we will have the ability to pass that same philosophy down to the--the same condition down to the subcontractor. That's a part of our RFP with the contractor, that he will accept it if we have to accept it.

MR. GERTZ: Our only caution on that--my caution is the same as Jim's, that pretty soon then you get--if it's real money like that, you get into the contract change process of he's saying, gee, I could have made that 20%, but you caused me to slow down here or you didn't respond to approve my drawing in time and you get into a lot of that.

DR. BARTHOLOMEW: You are, anyway.

MR. GERTZ: The award fee is just a little more flexible
than that.

MR. FRASIER: It's much more flexible. I think, gentlemen, the most important thing that you can have between the contractor and the subcontractor in this case is mutually agreed upon expectations. And, once you get that, you can deal with all the rest with relative ease.

DR. CANTLON: Okay. We're recessed for 15 minutes.

(Whereupon, a brief recess was taken.)

DR. CANTLON: Hugh Cronin? Well, Hugh wanted to start off, but I guess he hasn't returned to the room yet. Let me push off to a slightly different approach to the issues on management and administration. Oh, here, he is. Hugh, you've got the chair. Finish your questions and then we'll switch gears a little here.

MR. CRONIN: Thank you, John.

That last discussion got so interesting that everybody wanted to participate and I hadn't finished the rest of the questions. Now, let me see if I can get back to where I was.

One of the gentlemen got up and also--when we were talking about the two plus two, somebody else got up and said that normally these award fees are about 20% base fee and 80% award fee. I don't really remember who said that. Was that your statement, Dale?

MR. FRASIER: It could have very well been mine. That's
1 a very negotiable thing. Generally, the way it works--
2 DR. CANTLON: Could you use the microphone?
3 MR. FRASIER: The higher base fee that you take, then
4 your multiplier for award fee goes down. So, if you're
5 willing to take the risk and go 100% award fee, then your
6 award fee multiplier is higher. So, if you're willing to go
7 more at risk on award fee than base fee, you can get a higher
8 pool.
9 MR. CRONIN: Okay. There was another--
10 MR. GERTZ: Let's make it clear. That's 20 or 80% of
11 the 2 or 4%.
12 MR. CRONIN: Right. Right.
13 MR. FRASIER: No 80% fees.
14 MR. CRONIN: Just in general, what is the maximum allow-
15 able?
16 MR. GERTZ: It depends upon the type of contractor. The
17 DOE regulations say that for a construction contractor it's
18 in the, I don't know, 3 or 4%. For a different operating,
19 it's different. So, I don't--10%? 10%.
20 MR. CRONIN: Total fee, base plus award, 10%?
21 MR. FRASIER: And, that would generally be where the
22 volume is pretty small. As your contract gets larger, it's a
23 regressive curve.
24 MR. CRONIN: Yeah, I understand that.
25 I believe, Dale, you mentioned something about a
change in the regulations that are now going to allow you to
issue incentive type contracts, as well?

MR. FRASIER: No, there's a new accountability regula-
tion in the DEAR which we're not under yet. But, basically,
what it says is there's a provision there which improved the
fee schedules, but put part of even your base fee at risk.
In other words, some of the items that we've always been
reimbursed for like fines and penalties and damage of equip-
ment have always been covered by the Government. Under the
accountability rule, while your fee schedules may go up, some
of that may be at risk. It's called the accountability rule.

MR. CRONIN: So, am I understanding you correctly then
now that under the procurement guidelines, you're not allowed
to issue incentive type contracts?

MR. FRASIER: I don't say that we're not allowed to.
I'm just not sure. We've always been under the CPAF and it's
worked well and that's what we chose for the type of con-
tract.

MR. GERTZ: They're allowed to issue a CPAF, but not
strictly--

MR. CRONIN: I'm sorry, I didn't hear that?

MR. GERTZ: Okay. I'm sorry. They're allowed to issue
a CPAF award subcontract and that's different. That provides
incentives, but it's not an incentive contract as we might
have discussed what an incentive contract--
MR. CRONIN: Well, that's the whole problem from my perspective. There truly is no incentive for a contractor to reduce costs.

MR. GERTZ: Well, he gets more fee.

MR. CRONIN: He gets more fee, yes. When you talk about 1 and 2%, I'd have to draw a couple of curves and see where the break even and the marginal return is and all that. And, I'm sure they all do it and they have curves that are a lot more better defined than I'll ever do. And, they're in business to maximize their returns.

MR. GERTZ: And, that's in fee because cost doesn't maximize their returns.

MR. CRONIN: That's the problem. That's exactly the problem and I don't know, maybe you have a restriction in not being able to give an incentive type contract. But, if you have the mechanism, that's certainly one thing that I would suggest you look at is if--I think, Jim was alluding to it before--if you can define under any scenario, if you can define the scope of work and then negotiate and agree on a target estimate--that's the normal vernacular that I'm accustomed to--and then if the contractor through his ingenuity, his motivation, whatever, can reduce that cost by X number of dollars, that he should be able to directly participate in that savings. And, one of the gentlemen was talking about in some of these Government type contracts
where the contractor would actually get 20% of the savings and the Government would get 80% of the savings. Now, there is a big incentive. The problem though if you're going to be limited to the guidelines where they can only make 4% or 6% or whatever and he starts bumping up against that with this incentive type payment, then again as soon as he gets to the maximum again, he loses any incentive to further reduce costs.

MR. ROBERTSON: Let me clarify a point on that.

MR. CRONIN: Yeah, please, Robby?

MR. ROBERTSON: All of that is not with regard to the limit. First of all, the numbers that we're talking about in the 2 to 3% range, these are for M&O contracts. These are for M&O contracts. This is not an M&O contract that we're letting. This is a construction subcontract, it won't be under the M&O provisions. Therefore, the regressive fee curves do not apply to that. Now, the point is though that the incentives that are--let's see, the award fee that you obtain under these kinds of contracts, plus any cost incentive that you might obtain, i.e. if it were a 20/80 share arrangement, those cannot exceed the statutory limit of 10%. Those combined. But, again, to pull back a little bit on what was being said earlier, if you give a contractor a zero base fee, you typically give him an opportunity for a 10% total award fee if he got a score of 95 or 100 or whatever it is. If
he's got a 2%/4% base, you might only let him go to 7% max. See? So, it depends again on how much of that the guy wants to play at risk as opposed to what part is safe.

Let me also caution though on the other side of that, cost sharing, because--let's separate clearly into two things. Award fee is one thing and cost incentive sharing is another thing. Those are two separate things. Typically, there's a down side that goes with the cost sharing. That is if you overrun those costs, you pay 20% of those overruns until you've exhausted your fee.

MR. GERTZ: And, I think, as Jim cautioned and certainly as I cautioned the project managers, before I get into an incentive contract or allow my subcontractors to, I want to have a defined scope of work. I don't want to spend time on contract changes and claims and lawyers because it becomes just as aggressive in an incentive contract, as Bart points out, as it would be on a fixed price contract because now they're talking about real money.

MR. CRONIN: But, you have the same thing in the straight award fee. You have the same thing in the straight percentage of cost fee.

MR. GERTZ: Not necessarily.

MR. CRONIN: As the scope of work changes or there are changes made in the work of any type, you have to have a basis of renegotiating.
MR. GERTZ: Of course, but it's a little more different than the litigious process that construction claims go through. The award fee is an arbitrary process not subject to appeal. You have to have an understanding with your contractor as to what you expect from him and they have to understand your expectations.

MR. CRONIN: Yeah. You say not subject to appeal, but it is subject to litigation.

MR. GERTZ: I don't know. I'm not a lawyer in that area. I know of nobody who has litigated an award fee analysis.

MR. CRONIN: Okay. Well, and obviously the reason is that if a contractor has no risk and he starts off from a baseline of zero or break even, so to speak, then he has to look again at return on his investment and he has costs to go to the next step and so forth. So, yes, it definitely is different. But, the final question on this subject, what mechanism do you have to adjust the target estimate or some such number? When you change the scope of the work and the contractor comes in and he says, yes, you're going to shut me down for three days. That's going to cost $50,000. What mechanism do you have to adjust his evaluation on that basis?

MR. GERTZ: In the award fee process or in the--

MR. CRONIN: The way that you plan to do it. I don't know.
MR. GERTZ: Okay. I'll let REECo respond to the specific, but I'll tell you how we do it now with the four contractors we have. We just write a letter and they say we'd like to change our award fee milestones because you've changed our scope of work. Or, when we gave them a new scope of work, we said and, oh, by the way, your award fee milestones will be changed to X, Y, and Z. And, they'll say that's reasonable or unreasonable and we'll negotiate.

MR. MATYAS: Carl, do you have the authority to approve those increases in costs at your level?

MR. GERTZ: Yeah, I control the funds that have been allocated to me by John Bartlett. So, I control $244 million worth of funds and I can give REECo 50 and the M&O 50 and USGS 30, and if somebody says we got lots of big problems we need to study at the USGS, I have to shuffle those funds or allocate them at the beginning of the year. But, I do have authority within that range.

DR. CANTLON: Are we about finished with this category?

Yes, Bart?

DR. BARTHOLOMEW: One point and Ed Cording brought it up originally and then you alluded to it again, Carl. In that the decision of what percentage of the award fee is going to be awarded to the contractor is a unilateral decision on the part of an official in the administering organization. And, as you said, it's a unilateral decision and it's not appeal-
able. My understanding is that the basis of evaluation is a matter that is negotiated with the contractor.

MR. GERTZ: That's correct.

DR. BARTHOLOMEW: And, in the event that those negotiations become deadlocked, the owner's authority unilaterally establishes the evaluation procedure and the contractor has the right to demand AAA arbitration if he thinks that's unfair. That does not apply to the evaluation of how much of that fee he's going to get after the job is done. Is the fact that one is subject to arbitration and the other not a requirement of the Department of Energy acquisition regulations or is that something that administratively you've decided is the best approach for this project or what? Could you enlighten us?

MR. GERTZ: I don't know to tell you the truth.

DR. BARTHOLOMEW: It's there. I know it's there. Does someone wish to comment on that?

MR. GERTZ: Who is our contract experts--

MR. FRASIER: I think it's the latter. I think it's the administratively.

MR. GERTZ: Are you subject to arbitration on the--your M&O contract is not subject to arbitration for the--not for the evaluation, but for the negotiation of the criteria?

DR. BARTHOLOMEW: I think your documents do state that the setting of the criteria for the award of the fee is a
negotiable matter and that that is subject to arbitration.

MR. FRASIER: But, if we disagree, they can implement whatever they want unilaterally and there's no dispute mechanism.

DR. BARTHOLOMEW: On the award of it after it's been set.

MR. FRASIER: As well as the criteria and the performance evaluation plan.

MR. CRONIN: Just one further comment on that then.

There was a gentleman who stood up earlier in the audience and he said that he did have this kind of a problem with some agency that he was working with on an award fee basis.

MR. GERTZ: Me, yeah.

MR. CRONIN: Oh, it was you, sure. Okay, right.

MR. GERTZ: That's right.

MR. CRONIN: Okay. You were walking around, I guess, then. And, so you have the firsthand knowledge of how that works if there is no mechanism for negotiation.

MR. GERTZ: Yeah, we just went and did our work and the Government gave us what they thought it was and we spent time building facilities as opposed to arguing about award fee. And, that didn't work out very good and they changed both the management of the contract or the management of DOE after a while. But, that was where we came to absolute--couldn't agree on anything.
DR. CANTLON: Okay. Before we leave this category then, anybody in the audience have a burning desire to make a comment or raise a question on this issue?

MR. HAYES: On the issue of funding, is that what we're talking about?

DR. CANTLON: No, this is the fixed price contracts, the costs, the dynamics.

(No response.)

DR. CANTLON: I want to move now to another one of the other categories on our discussion list. This would be on the equipment and material acquisition and mark-ups. Who would like to comment on that? Bill, are you the appropriate kicker-off/off-kicker?

DR. SIMECKA: Well, I guess I'm not. I don't know what the issue is.

DR. CANTLON: Ed?

DR. CORDING: I think one item here is that the process of trying to get projects started and get underground and start the boring machines. There's a lead time on acquisition of the machines and it's a situation that, I think, people in the underground industry find themselves in occasionally of trying to get a machine started and acquired and at that point not having the subcontractor on board. And, that's a situation that exists at this point here and I thought it would be interesting to learn a little bit first
about what the status is of the RFPs that are out now for
TBMs and what the anticipation is on that and some discussion
on how that's going to interface with the contractor that
comes on board perhaps after a machine is acquired. At
least, that's my understanding at present of what some of the
planning is.

DR. SIMECKA: Okay. We are pursuing with--I mean, REECo
is essentially in the process of the procurement action
necessary to put out an RFP. They are not waiting for the
underground subcontractor to put that out because we're doing
it as fast as possible. When the underground subcontractor
comes on board, their job is to assist REECo in managing the
underground activities. But, REECo is the procurement agent,
if you will. And, Bob, can you add to that?

MR. PRITCHETT: Yeah. I'd like to make sure that
there's no misunderstanding on one aspect here, Ed. An RFP
for a TBM has not been issued yet.

DR. CORDING: All right.

MR. PRITCHETT: It's in the stages of preparation. The
specifications that that RFP will convey to potential pro-
posers are in the final stages of preparation and we're
trying to work those documents in parallel. When the speci-
fications are released to us, we should be able to issue the
RFP within a relatively short period of time. I'm not sure I
can state an exact date that we might anticipate that now,
but I'm hopeful it will be before the end of this month.
Bill, can you help me with the specification status update?

DR. SIMECKA: Well, my understanding is that we're hopeful to get that out around the middle of this month.

DR. PETRIE: It's really germane to the discussion. We are still aiming towards getting the RFP on the street by the 16th of November. But, it's nip and tuck and it will be two days when we have the other--well, it won't be earlier than that, I can almost guarantee you that, but it will be pretty close.

MR. PRITCHETT: Now, to the other aspect of that, Ed, admittedly, we're a little bit behind our time line with respect to obtaining the subcontractor. We had originally hoped and it was our plan to have had our subcontract awarded so that there might be some technical participation by the subcontractors expertise in the development of the specifications. We've been somewhat overcome by that. I'm quite confident though that we will have our subcontractor in place in time to help us evaluate the proposals and work with us during the manufacturing or reconditioning process.

MR. GERTZ: I think that's the question. We're here with the issue of the TBM RFP. We hope to receive TBM proposals. In an ideal world, you would have had your subcontractor do the TBM. We're not in an ideal world. We need to get underground as quick as we can, I believe as the
project manager. We hope--now, you give me your best date
for awarding the subcontract for underground construction.
Best guess?

MR. PRITCHETT: I think probably end of January/early
February.

MR. GERTZ: Okay. In this time frame where he will then
help us participate in the evaluation of the TBM proposals,
provide major input because he's the guy that's going to use
it. And, you know, it's not beyond belief that he says he
doesn't like any of the proposals and maybe we need to start
over or something. But, we hope that we had enough expertise
in developing the specs that he will buy into it because if
he's going to be responsible for the underground construc-
tion, he's going to have to have some kind of buy-in on it
and we're going to have to reach that kind of agreement.

MR. MATYAS: Question, Carl or maybe Bob.

MR. GERTZ: Yes?

MR. MATYAS: Let's say that he did get aboard and par-
ticipated in the procurement. Supposing at the point in
time, he wanted to change the nature of the machine or, say,
the diameter. What kind of time is involved in moving from,
say, your--what is it, 25 footer to a smaller? Do you have
requirements that will take several months to readjust that
or do you just strike out the diameter--

MR. GERTZ: Now, you get into the procurement law that
if it's a major change do you have to go out and follow so much procurement and so much--yeah, you know, if it's a major--if it's a major change, now you may have new people who would have been available to bid and you probably got to start the procurement process over which is cumbersome.

MR. MATYAS: What you've said repeatedly is you want to get into the ground and I think everybody here wants you to get into the ground. And, it may be a strategy for getting into the ground which requires changing that TBM.

MR. GERTZ: It may be and that's certainly some of our thoughts.

MR. MATYAS: I guess my question is how many months would it be to make a major change to that procurement thing?

MR. PRITCHETT: I don't really anticipate a major change.

MR. GERTZ: If you were to start a new procurement, it's about two months for them to prepare, preparations, and on the order of three to four months to evaluate. So, if you started a new procurement, you start with a six month delay before a guy even starts to get on board to build anything for you.

MR. MATYAS: Okay. That's what I wanted to know.

MR. GERTZ: I mean, that's kind of off the top of my head, but that's why we've--right now, we didn't want to wait that six months even right now.

MR. MATYAS: Thank you.
MR. GERTZ: And, once again, before we as a manager would agree to something like that, we'd have to have a good analysis and a good case for it because our ESF alternatives said we needed a 25 foot ramp. Our analysis, be it ventilation or traffic or conveyors, all point to a 25 to 27-1/2 foot diameter.

MR. PRITCHETT: Carl, I would like to note that some months ago, we did issue in the Commerce Business Daily a source advertisement for a generic kind of machine and we were very pleased to have received eight different responses to that.

MR. GERTZ: Eight responses of interest.

MR. PRITCHETT: And, so the commercial industry, the manufacturers, and the rebuilders, and so forth, they kind of know what we're up to and I think they're anticipating it.

DR. CORDING: I recall there was some design work certainly that has been done on a machine specification for both an 18 and 25 foot machines. And, the TBM RFP, is that going to be for—there's going to be an RFP for one machine, two machines--

MR. PRITCHETT: One machine.

MR. GERTZ: One machine. I think I showed you yesterday the diameter in meters, whatever it was, 7--

DR. CORDING: Well, yeah, 7 to 9 something.

MR. GERTZ: Yeah.
DR. CORDING: That's ranging from 25 to 30 feet, as I recall.

MR. PRITCHETT: The advertisement in the Commerce Business Daily, at that time we merely indicated a size range to --

MR. GERTZ: But, our specs will be more specific.

MR. PRITCHETT: We will have, I believe, a specific size when we go out with the RFP for the machine. Is that correct, Ted?

DR. PETRIE: Within the spec, we are going to put in a range from a minimum that we can use to a maximum that we can accept in our starter column. And, that will be--let's see, in feet, it's about 27-1/2 to about 31.

MR. PRITCHETT: I'm sorry. Then, I stand corrected on that.

DR. CORDING: Now, that's a range that--that means you would be at some point telling them what the actual diameter is. So, how are you going to give them the flexibility?

DR. PETRIE: We're leaving the option open that there might be a machine available. The schedule is very important to us, okay? If there were a machine available that were a 30 feet machine, but I only need 27-1/2, but I can get that 30 foot machine in two weeks, the likelihood is that I will go with the 30 foot machine.

MR. GERTZ: And, the costs are advantageous and its
performance or response.

DR. PETRIE: Again, if I were able to save $5 million by going to a machine that was available and happened to be the larger size, I would go with that. In other words, we need to get our proposals in on that basis and then make our assessment and whatever is most advantageous to the Government, that's where we're going.

DR. CORDING: Certainly, there's a lot of experience in situations where a tunnel contractor chooses to go to a larger size because it is—he can use equipment that's a better cost. But, that cost is not just the cost of the equipment; it's the cost of the entire project, the entire tunnel. So, if you save $5 million by going to a larger machine, you may not be saving and probably will not be saving $5 million in the tunneling costs. So, it's the overall costs, I think, that one would look at in a situation like that.

DR. PETRIE: We concur. On the other hand, you know, it costs us so much a month to run this project and if we can save six months in the project, that really is a substantial amount of money. So, again, all these things have to be considered.

DR. CORDING: Sure. And, certainly, I think we're all, as we've said, interested in getting underground in the most efficient schedule possible.
MR. GERTZ: Ed, your point is exactly right. That's part of the evaluation process. What is the total systems cost? If you save $2 million or $3 million on a machine cost, but does it cost you more to do the five miles of excavation? Your second point about the second machine, I would like to think our plans are for the subcontractor we bring on to procure a second machine when the time comes. At least, that's my view of it right now.

MR. SMITH: I guess I've got a comment about the contractor contributing to the specifications for the machine because the Stillwater machine in the Central Utah Project is a classic example where the machine was specified by the Bureau of Reclamation and it had a great deal of problems. There's a glaring anomaly up here when I relate to what I'm doing right now in Chicago to what's there. Our predictor is the backup systems and we are--our tunnel machine is being rebuilt right now. We started the first of the month. And, we will not see first delivery of our conveyor systems until May or June of next year. And, they are operating under a normal schedule--I mean, actually, an aggressive schedule to produce that. Interestingly enough, is that the costs of our conveyance system are in excess of the tunnel boring machine, too, as well. So, we have about a $7 million to $8 million investment in the backup system, and a tunnel machine, we purchased in the 3 to 4 range. And, by
rebuilding, it will be the 7 or 8 range. But, I don't see up here where your backup systems are being included in your schedule.

MR. GERTZ: I don't know where you're starting your TBM, but we fortunately don't need a whole bunch of conveyor early-on, but we will need it as we get further.

MR. SMITH: We're starting our TBM exactly as you're starting your TBM. So, we need the conveyor right from the very moment.

MR. GERTZ: Yeah, okay. Right, okay. Ted, do you want to address--

DR. PETRIE: Well, as a matter of fact, we will be addressing that. We had decided to look at the conveyor system in conjunction with the selection of the TBM. As I said, until we get a TBM selected, although we can do a lot of preliminary work, I'm not sure we can do much in the way-- we can't start the procurement action.

MR. SMITH: The conveyor system really is the nucleus of the operation. It's an extremely important part.

DR. PETRIE: I absolutely agree. Absolutely agree. But, as you pointed out, you can get them in about six months. Okay? And, we feel that the six months is consistent with our needs.

MR. SMITH: That's correct. But, it took some time to make a very selective process to get what was the best for
the situation.

DR. PETRIE: We concur. We concur.

DR. CANTLON: Yes?

MR. SANDIFER: I'm afraid that the perception has come across yesterday and today possibly that we are doing just-in-time spec writing, just-in-time decision making on the ramp size, and I would like to address and clarify that, at least from M&O's perspective.

The 25 foot that was mentioned was a product of Title I. That was an RSN activity. That is a conceptual design phase. The purpose of Title II is to confirm the design. In the Title II activities that RSN just concluded, one of the activities was a ramp sizing study which came up with a 27-1/2 as opposed to a 25. What may appear to be just-in-time design is not that, I would contend. It's the re-sequencing that we had to do to get the accelerated ESF schedule. If we had left the schedule without the acceleration, there would be have been lots of time between the ramp sizing determination and the ultimate TBM spec preparation.

So, I wanted to make that point and clarification.

MR. BEALL: Carl, has there been any consideration for putting an option in for a second or a third TBM so that we could save somewhat of the up-front time?

MR. GERTZ: Not, I think, in this contract.

MR. BEALL: That's assuming that we might get some
MR. GERTZ: I think not in this contract. I think that the concept, Ken, that we're now pursuing from the project's point of view is the once through loop with the major TBM and then a second TBM for Calico Hills down the line when that time comes. And, I would like to think our underground constructor, the subcontractor to REECo, will bring the expertise to the table to help us choose that second machine, essentially, and choose whatever—you know, we had a great discussion, Ed, with all your staffs about what do we do on the add-it, so to speak, and our underground constructor, we hope, will add significantly to those kind of decisions and choices, much like you all added to our knowledge yesterday on it.

DR. CANTLON: Other questions or comments on equipment?

MR. PRITCHETT: If we're talking equipment generically, I would call your attention to the green part of the summary schedule which is the site preparation work for the north portal and associated things. Most of the equipment necessary for those activities is planned to be matrixed over from the NTS. It's already being arranged. Most of that equipment will begin to be mobilized the week of November 23. There are a few items of a minor nature and perhaps one of a major nature that we may have to lease, but the rest of that stuff is pretty well under control.
MR. GERTZ: John, I guess I'd like to point out one other thing since we're talking of schedule. When you bring up a great point about, well, we have all the back end of the TBM at this time and ready to go. You know, this is aggressive, as I think we all agree, even to get a TBM here. But, once again, we will have started drill and blasting. At this point in time, we're going to have an indication of what the rock is like right there. We want to continue drill and blasting a little further. Is our TBM going to be delayed? And, the project management team is going to have to make some decisions. Do we stop at 200 feet with drill and blast? Do we continue to 300 or 400 while we're waiting for the TBM? All those decisions yet to be made. Our only firm decision is to try to get 200 feet into the mountain by mid-September and get a TBM here as soon as possible, and once we fill in some of the blanks, we'll be able to make some of the next decisions.

DR. CANTLON: Other questions on the equipment?

MR. GERTZ: The other thing I guess I need to say for those who are aware, the drill and blast activity is still well away, almost a mile away, from the repository block. There was concern about drill and blasting. Well, if we go another 200 or 300 feet, we're still not very close to the repository block. We have to assure that it doesn't compromise the scientific ability to map or, as we go through
the Bow Ridge Fault, compromise any of those studies.

DR. CORDING: Well, the situation is if the TBM is on the critical path, then you can make--you go further with the drill and blast, you're not interfering with that operation. In other words, you've got time where you can do that before the TBM is mobilized.

MR. GERTZ: Exactly.

DR. CORDING: So, once you can mobilize the TBM, you want to get it in as quickly as you can.

MR. GERTZ: I didn't want to leave a false impression. We want to put the TBM in the start tunnel as soon as we can get it. But, in the meantime, if there is a lag in schedule due to waiting for a TBM, due to getting at the right conveyor system, or whatever, we do have an opportunity to make a choice to continue drill or blast or not and still be making progress as we're waiting for the TBM.

DR. CANTLON: Okay. That brings us, I guess, then to another category on the list which is the disputes review board. Ed?

DR. CORDING: If I might make a comment on that topic, many of the people here and the consultants have been involved with disputes review boards principally on contracts that are fixed price construction contracts. And, we've seen increasing use of this vehicle in the underground construction industry to take care of disputes that arise during the
course of the contract between contractor and owner.

There had been some talk about certain items in the project here can be fixed price; in some cases, it may be situations where you're working with purchase of materials and equipment. But, one of the things we presented yesterday was the possibility of tunneling through the facility with a separate--through the Calico Hills with a separate portal. The possibilities in a situation like that or in a situation where you can define the construction and to the point that you can specify a product provides at least a possibility that one could consider that type of a contract. But, one of the things that we've found very useful and the concerns I know that Carl has very validly expressed is the problems that one gets into with litigation and having to go through those sorts of situations.

And, I thought we'd just briefly comment on our experience with the disputes review process and Joe Sperry has been a person who has been instrumental in developing that within the construction, particularly underground, industry and thought he could give us a few comments on what it is and how it works.

MR. SPERRY: The American Society of Civil Engineers published a booklet. It's in its second edition now. I think it's the third printing. This is sort of the handbook of the thing. I notice Bob Matyas has a copy also in case
any of you would like to look at a copy of it. I guess what you'd say, it's a unique form of alternate disputes resolutions. The unique part is that it works throughout the construction of the project to solve disputes. They typically meet every three months on the job site and I think the beauty of this process is that you establish rapport between the owner and the board and the contractor and the board. In other words, between the parties and the group that is going to advise on settlement of your disputes. This is non-binding. They're just recommendations. They're recommendations are admissible in any future litigation or arbitration or wherever you take the dispute after the disputes board. There's a lot of details to it. I'm sure any one of the consultants here and Dr. Cording can answer questions on it.

I'll just go over some of the background of the thing and the success. The success has been—I don't know, I'd take anybody's correction on this, Bart, but the success has been outstanding. There has never been a case, save one, taking the litigation after the parties received a recommendation from the disputes board. Now, I must point out what that save one is. There was a $2.5 billion dispute—that's billion with a B—on the English Channel Tunnel. The English Channel Tunnel had a disputes board. It was organized a bit differently than what the SAIC book recommends, but it's essentially the same thing. Well, they had a $2.5 billion
dispute and the recommendation went against the owner and the
owner took it to arbitration and the arbitrators came down
and recommended for the contractor and I think the owner--
correct me if you know the right figure--but I think the
owner was ordered to pay a quarter of a billion or something,
that's 250 million, a month to the contractor or 150 million,
something like that. So then, the owner took it on to the
Chamber of Commerce Board of Arbitration in The Hague and
it's there now. So, except for that, the record has been
perfect. Now, I should also mention on the English Channel
and this input is almost two years old. But, they had set-
tled 12 disputes before this big one came up without any
problems.

There's about $3 billion worth of completed work on
about 50 projects to date. I don't know how many disputes
have been settled, but there's been no litigation on that $3
billion worth of projects that use disputes boards. I think
the underground construction industry has been somewhat
remiss, but we're seeing the hole in the doughnut, I think,
and we, I believe, implied that this was especially applic-
able to tunnels. I totally disagree with that, but the
process came up through the tunneling facet of the construc-
tion industry. I think it's just as applicable to all types
of construction and I think in the past year probably as many
projects on other than tunnels have incorporated dispute
review boards and their documents. But, it's almost ubiquitous on tunnels now. Very few tunnels go to bid without a disputes board.

MR. GERTZ: Joe, excuse me, was it mostly for fixed price contracts or could you find an application to a contract like we have? Because we still have arguments between ourselves and our contractors and perhaps it would be even applicable to our type of operation.

MR. SPERRY: Absolutely, all types of construction contracts. The people down in Phoenix, you know, they built a new stadium for the Phoenix Suns. Now, I don't know what type of contract it was. But, those people were just totally enamored of the process. I understand now they have it on a large office building they're building at the--the state of Arizona is building. But, it was used on a $250 million paper mill in Jackson, Mississippi some years ago and very successfully. And, that was a cost plus and they had incentives in that and they had to guarantee the process. It was a design constructor and in the process they had some problems. They weren't outputting as much paper as they originally wanted, but that was all settled. It's been very successful.

Now, there's two things I want to point out. If you're going to really get in and handle disputes with this, you see there's no discovery as part of this because this
isn't a process that goes through the legal system. But, you have to be able to determine what the contractor had in mind when he bid the job. And, so we used what's called escrow bid documents and that's very important to the process in order to--and the board very seldom accesses the escrow documents, but there are provisions again in this booklet on handling of the escrow documents and that is a substitute for discovery when you use this process.

The latest thing that's happened in this and I believe this has happened up in the state of Washington probably on a dozen jobs and otherwise on perhaps half a dozen. They incorporate partnering which, I'm sure, if you're reading the Engineering News Record and the trade documents, you see references recently to partnering. That's incorporated in addition to disputes boards and that appears to be very successful and it's interesting. It's sort of--I've heard it referred to as a bit of a touchy-feely exercise, but it gets the contractor and the owner to establish rapport much better than without the partnering. It's something I think that used to be done 20 or 30 years ago just in the normal course of contracting and contracting has gotten so litigious now that perhaps that doesn't happen. But, so several contracts are using partnering and I'm recommending that on a contract that goes out next spring in San Francisco, to be incorporated, as well as disputes boards.
I think there's a lot of people around the table here that can answer any questions on this.

DR. CANTLON: Bart, did you have a comment to make on this area?

DR. BARTHOLOMEW: Not particularly, John. Perhaps, one point. Carl, I don't think there's anything in the typical dispute review board provisions that would make it particularly applicable to a fixed price contract as distinct from a cost reimbursable contract. It could be applied to either. Probably, the feature that Joe alluded to, the escrow bid document provision wouldn't have the same applicability in a negotiated contract that it would a fixed price contract where there's no negotiation that's involved when the contract is entered into. That probably, in my opinion at least, would be something that you would not probably want to incorporate into a situation such as this. And, boards have been set up with essentially comparable provisions in all other respects with the exception of that.

MR. GERTZ: Yeah, I appreciate those comments because, as the project manager, we're always looking to find a way to make the team work together and I've showed you the team that we have now and we'll have other people coming on as part of that team. And, certainly, a subcontractor is going to come in and he's going to be a little skeptical about the whole process because this is a little different program and per-
haps he would feel more comfortable if there were an impar-
tial disputes board that were available to him. So, you
know, I think it's a good idea not necessarily for just
construction contract claim disputes, but just the ordinary
disputes that go on in the management of a cost type contract
with some type of incentives to it.

DR. BARTHOLOMEW: Yeah. If you have a disputes clause
in your contract, if there is a disputes clause there, then
the concept of a disputes review board would be applicable if
you would consider it.

MR. GERTZ: Yeah, I'm sure we have a disputes clause.

DR. CORDING: Of course, one of the major advantages is
not just keeping out of litigation, but getting the project
done. You know, that you litigate it rather than everybody
working for the next few months to develop their claim and
the project just goes down the tubes.

MR. GERTZ: Yeah, or you don't want the situation that I
described where the owner and the contractor just didn't talk
and they just left and went to their work. I mean, that's
not appropriate.

DR. CORDING: I've seen projects where they had plenty
of time to look at the problem and they went on through and
they basically destroyed the underground the way they built
it because they couldn't come to an agreement and it ended up
in the Courts years later. You know, those sorts of things,
I think, the disputes review board came on as a result of that type of experience.

MR. MATYAS: Carl, I'd like to add to that. You've heard my concern for the complexity of the job that you're shouldering, whether your disputes review board ever heard a claim. From your standpoint, as the leader of the project, it would be a very great comfort to you and a very user friendly device. The key issue--

MR. GERTZ: Certainly, I'm sensing that just sitting here listening to you all.

MR. MATYAS: You're going to be a lot more comfortable when you go home in the evening if you have one.

MR. GERTZ: Impossible in this job.

MR. MATYAS: Well, every little bit helps.

MR. GERTZ: You're right.

MR. MATYAS: But, one thing that hasn't been brought out and that's the timeliness of response of a DRB. They know what's going on from the beginning and the way it's been practiced for the last four or five years is these people who are really--they're not professionals in the--their business is not arbitrational like members of the AAA. These are people who--there are a number of them sitting in this room who have been sufficiently concerned over contract practices that they willingly serve and are really committed to participating. Most of them can make a lot more money doing their
jobs than sitting on a disputes review board. But, so far, I think the success is due largely to the fact that they were --you know, they'll show up within days. They'll just change their calendars and show up and hit the problem as hard as they can before memories get foggy and adversarial relationships develop, emotions flare. These people will come on it and work with the leadership in both sides and the record has been perfect except for our friends in the Channel.

DR. CORDING: And, they schedule regular meetings, but they keep up on things and can encourage parties to discuss things. Sometimes, things come up at the meeting that don't otherwise come out.

DR. CANTLON: Okay. Well, let's shift then. We've got two more items that we'd like to discuss. One would be shifting from looking at optimizing the sub-units within the system to looking at the general systems optimization. And, Carl, it would be useful maybe for you to describe for the Board and its consultants the procedures that you have, the tools that you have to sort of look at optimizing the total objectives of the system, so that you can overcome the tendency of every organization to sub-optimize the world for itself.

MR. GERTZ: Let me just think about that a second, but that's a battle we go through every day in managing a project and I need to narrow it. You know, I'll provide you
1 with some of the guidelines that we use to manage the pro-
2 ject, not necessarily how it fits into the overall transpor-
3 tation system or the MRS system, but just assuming we're
4 going to receive spent fuel and/or glass logs at the reposi-
5 tory if Yucca Mountain is suitable. Then, how do I trade off
6 what Larry Hayes needs, what Dale Foust needs, what Bob
7 Pritchett may need? How do we do that?
8 
9 And, I think it comes down to, one, establishing
10 some goals and where we're going in the long run and where we
11 need to go in the short run. They may not always be compat-
12 ible, but we do have a goal of determining the suitability,
13 providing a license application. I think you've seen the
14 chart we use, the convergence type chart. All our studies
15 need to converge and get some answers and get some results.
16 As you heard John Bartlett talk to you, we're looking for
17 results and answers and doing what is necessary.
18 
19 In the meantime, we need to have constituent sup-
20 port and by that, I mean, the Congress, the utilities, or
21 whatever for what we're doing now because 2001 is way out.
22 People can defer their answers to that. So, essentially, our
23 process is what is the most important thing we need to do in
24 the next year or two to meet the 2001? We develop that and
25 our budget process is the one we use because everybody--I'll
26 set some priorities based upon the Secretary of Energy's
27 direction passed down through John Bartlett.
Right now, they include getting underground as soon as we can and doing some balanced surface-based. I'll then sort out those priorities and distribute them to my team, my management team within DOE, who then goes to the people who do the work, the contractors, and they develop a program to meet those goals. As I pointed out last time, that program that they provided to me was $300 million and I said I didn't want it. I only had $244 million and how could it be $300 million just to start a ramp and continue surface-based testing. And, we went through a long, arduous process of what's in and what's out and what's necessary to support it. And, it's an interactive process with not only my management, but the management of the contractor and scientific organizations. Nobody is usually totally happy in that kind of a process.

The project manager has to make some decisions. I listen to the appeals or impacts, we change some of those decisions, and as we go through the year, we'll probably even change some more.

So, how do I optimize the parts? I think, we use the prioritization similar to what Russ set up or what he thinks is important to science. I have to then add to that what's important from an institutional point of view. You know, I've obviously testified, as your former Chairman has, in front of Congress. We've had the senators out here. We
1 deal with OMB to what is important. We deal with the under-
2 Secretary. Things change, but I guess I try to optimize what
3 I think is the best road for the project in light of the
4 given objectives.

      And, I don't know--you know, I didn't give you any
6 specifics because it becomes a gut feel after a while for a
7 project manager. I know all the things are important, but I
8 can't do all the things next year. So, I have to make a cut
9 with input from my staff on what things I do.

10 As Larry pointed out, part of the process didn't
11 include some seismic studies. Well, we think because of the
12 recent earthquake it's important to be out studying seismic
13 issues. So, we put that up front. Even though there may not
14 be a scientific basis for it and even reading Dr. Allen's
15 comments in your quarterly report may not lead to a scien-
16 tific reason for it, but there certainly is the public per-
17 ception.

18      DR. CANTLON: Larry?
19      MR. HAYES: I think, Carl has given me an opening to
20 express something I very strongly feel about if I could come
21 up and throw up one viewgraph.

22      DR. CANTLON: Sure.
23      (Pause.)

24      MR. HAYES: Carl, I'm going to say some things that I
25 don't want perceived as criticism of you. It's my concern
with the system that you're working within. And, that system

go beyond DOE. It's everybody here. It's all of those
outside forces that keep asking you to do conflicting things.
So, your comment yesterday, you can't win, I understand
where you're coming from. I would like to say in the five
years I've worked with you, somehow you have won and we've
won because of the things you've done. You have kept the
program going. You have maintained critical work. So, I
want to preface my talk with that. Also, it's my hazy view,
okay? I don't have the information you have. I don't have
the knowledge you have. I'm looking at this from the
perspective of my concern over how science is funded in this
program and, frankly, some of the criticism that science gets
for driving up the cost of this program.

This is an overhead Carl showed yesterday and he
offered to let me use it so I could complain against him.
You look at the four blocks down at the bottom, the Survey,
the national laboratories. We are charged with doing most of
the scientific work that will identify whether or not Yucca
Mountain is a suitable place to store high-level waste. Yet,
62 million of this 244 is all that goes to that effort. I
think the laboratories would support me when we feel that's
probably not the kind of breakout we'd like to see.

Carl, you have often stated that we're here to see
if the mountain is safe. I believe that, the Survey believes
that, or they would not have reorganized as they did to
continue to support you. So, we believe that. But, I think
the scientific community, in general, also feels that they
are constantly being asked to cut their costs, to do with
less testing, to do with less information. Yet, we're not
proportionally the big cost in the program. And, yet, what
we're doing, I think, is critical to why we're here.

Dr. North, it's comforting to hear your gentle
reminder of why we're building this facility. All right, we
are doing it to collect scientific information. And, yet,
sometimes, it seems the construction, design, those sort of
things are the driving factors, not the science. And, I have
to express concern that sometime it appears that way. The
scientific community is being asked to almost rethink how we
do work. We're being asked to look at the very basics of
what's important to us in order to reduce costs and the
scientific community is doing that. An example is what was
discussed yesterday, the need for the Busted Butte facility.
I obviously came down against that facility because I felt
we can't afford it. We cannot afford it. And, we're being
pushed to go underground. We'll probably be underground by
the time that facility can be built. So, we might as well do
our work underground. That still leaves some people like
Sandia and Los Alamos in a very difficult position either
meeting schedules or really doing their work in the manner
that they're going to be comfortable with. So, maybe Dale
would like to respond to that. I have one more thing to say
and then Dale might want to say a few words.

The scientists are doing a lot to try to cut costs
in this program. And, all I'm charging you with, Carl, again
and again when we talk almost weekly, is just to make sure
the rest of the community takes a look at not only justifying
how they have done business, but also looking at ways to redo
business to give us some more money for science.

MR. GERTZ: Larry, I just need to point out in this
debate that we continually have I enjoy it and certainly I'd
like to reminisce about an activity three or four years ago
when the scientific community expressed a great concern about
QA and how that was restrictive and they couldn't do their
job and it was hampering good science. And, perhaps, we had
been a little too restrictive at the point. But, when your
scientists were asked to write the procedures, they were too
busy to write those and then they found they couldn't follow
them. Certainly, through your efforts and Don Horton's in
leading the quality integration group, we got the scientists
writing the procedures. The QA professional says that's
great. That looks like it meets our needs and your needs and
we were then able to come to a sound quality assurance pro-
gram that met the majority of the scientific needs and the QA
regulatory requirements. And, you led that group. And, I
I think that was enlightening for both you and the people that participated on it on both sides. And, certainly, you've set yourself up for this activity where I've asked you now to lead a group to look at those other costs.

I mean, while it's true that science occurs on the bottom, you couldn't do one iota if you didn't have a permit. We couldn't get a permit if we didn't have an environmental program. Probably, OMB wouldn't fund us if we didn't have a good cost schedule control program. You couldn't do tests in the ESF if we didn't design and build an ESF or a trench.

And, while, you know, you somewhat talked about 62 versus 244, a lot of that 244 is essential. The remainder of the 244 is essential for you all to do your work. It's not a new discussion that we've had, but since you put out your side of it, certainly I was going to offer my side of that. And, that comes back to, John, what you said, how do we make decisions and I'm going to expand on that a little bit with a couple of viewgraphs that went back to project control because we use that project control system to help identify what decisions need to be made.

MR. HAYES: I agree with everything you said, Carl, and that's why I started this with saying it's a system I'm concerned about and how you can change the system, I don't know. I'm asking you for another miracle. Either that or people have to give you money, okay?
MR. GERTZ: The system is difficult to change in these
days of environmental concerns. As I said, when I was in
Golden last week, Colorado School of Mines, I heard a private
contractor doing private drilling saying it was becoming
extremely expensive and he just had to pay $10,000 to clean
up five gallons of diesel fuel oil in a desert environment
and get all the proper buy offs from EPA and everybody on it.
And, that's not an NRC regulation; that's a national
environmental regulation.

DR. CANTLON: Dale?

MR. WILDER: Yes, I would like to follow up with what
Larry has just led into. And, I guess, it comes back to a
comment that has been around the project for some time about
the importance of perception. And, once again, of course,
I'm approaching this with a rather strong set of blinders and
those blinders relate to the work that Livermore is involved
in. But, given those blinders and realizing that Carl and
other project managers certainly see the bigger picture than
I do, there is a perception which I think sometimes does get
in the way of my feeling that the distribution of funding is
perhaps what it should be. And, I'll use an example, the
comment that was made yesterday about the reason why the G-
Tunnel was closed down. And, it was stated that one of the
reasons--and, of course, there was some discussion on this--
but one of the reasons was to be able to keep the scientists
at the national laboratories and the USGS on board and that there was not sufficient funds to keep G-Tunnel open and keep the scientists on board. We lost all of the people except one who had done the G-Tunnel experiment and they are not available. I've asked Abe Ramirez who was a leader of that effort on several occasions if he would come back and Abe is involved at Savannah River. He just is not available. At that same time period, I was asked to participate in what I thought was a total wasted effort, along with I don't remember how many, but it was so large that we had to rent a convention center to house everyone, for a month long looking at engineering design of a facility we knew would never be built because the requirements had already changed.

So, from my perspective, I guess, what I see happening time and time again is that when we're told we can't do this particular technical work unless we shut down other technical work, it does not appear that the tradeoffs are looked at up higher. It's always, well, you either have to shut Busted Butte down and go underground to do your technical work or you have to close G-Tunnel down to keep the technical people on board. And, it certainly seems that the technical is not where most of the money is being spent.

DR. CANTLON: Max?

MR. BLANCHARD: John, I sense that part of your question was asking what kind of management tools are available to try
1 to implement in controlling the program. And, despite what
2 some of the other people are saying, I don't want to leave
3 the impression to either the Board or the consultants that
4 we're without management controls. And, I want to tell you
5 right off the top of my head in about 10 seconds I wrote down
6 10 management tools that I think you all use and I know we
7 use in a very formal way. And, even though some people in
8 the program may think that some decisions are made on an
9 arbitrary and capricious basis, I assure you that that's not
10 the case.
11 Now, let me list some of these controls. We have
12 quality assurance audits, audits of all our contractors
13 including the DOE office, four times a year and the audits
14 are one week long. And, those audits are conducted in strict
15 compliance with 10 CFR 50. They verify by objective evidence
16 that the plans and the procedures are there and that the work
17 that the people do meet not only the intent, but the letter
18 of the law. Verbatim compliance is a process. And, those of
19 you that have worked with Admiral Richover know what verbatim
20 compliance means. We do that and we pass those audits and
21 our contractors pass those audits and the Civil Service
22 people in Carl's office pass those audits. The last one we
23 had was last month and we received only one CAR, corrective
24 action request.
25 Another one is we have an internal control system
driven by a DOE order called vulnerability assessments. Every area in our program that spends a million dollars or more goes through one or more vulnerability assessments which is a focus of a part of a waste, fraud, and abuse audit. These are done by people who are specialists in these kind of audits. And, we have audit teams that look at property, they look at contracting, they look at every area where things associated with waste, fraud, and abuse can occur. They've been ongoing, they're still ongoing, and we have DOE people that manage these and we have a pickup team of specialists that go around and visit each one of the facilities to see if we can account for all of our property or whatever it is that we're auditing.

We have a financial management system that follows DOE orders, but we also have a separate waste fund auditor, a contractor named Peat-Marwick. They audit the close-out of all of our contracting activities, whether it's the national labs or individual contractors. We also have in our office every day almost, certainly every week, a group of auditors from GAO that come from San Francisco and Washington and they're going through all of our financial accounts and our work plans.

We also have program reviews from some of the interested parties and you're one of them and you know that the NRC is one of them, but other groups of interested par-
ties that we give multi-day program reviews which includes not only the technical work, but the management aspects and the cost accounting from the Edison Electric Institute and various utilities, also NARUC, the utility commissions that oversee the individual states that operate nuclear utilities within.

We also have a project management system that Carl mentioned to you which is a form--

MR. GERTZ: I'm going to expand on that in a second.

MR. BLANCHARD: He's going to expand on that, but it's a formal system whereby we implement a cost schedule control system with a series of WBS elements. We've got about 15 now. They go down to about the 7th level of the WBS. We have cost accounts, tiers, a hierarchy of cost accounts that go down to summary accounts, as well as individual work packages that overlay work scope, milestones, and dollars. Those are created at the beginning of the year and they're monitored by the DOE staff and the M&O staff that are part of our product management control system. We keep the work scope, the milestones, and the dollars coincident throughout the year, and if there's a change to one of those, we modify the work scope, the milestones, and the dollars.

We have monthly project management reviews with the DOE people, aided by the M&O cost performance people, go through a cost performance measurement system where we look
at grants analysis on schedule and cost to see if anybody is under-schedule or over-schedule and under cost or over cost on these cost accounts down to and including 4th and 5th level. This includes all of the work that's being done by each of the contractors and the TPOs.

We have a formal, separate, independent management assessment that's done by a contractor this year elected outside and identified by the director of OCRWM, John Bartlett. They come out and they conduct a programmatic audit by interviewing all of the people in the management levels to see if we're following either DOE orders, or if there are no DOE orders, other regulations or general management practices. And, the current team that we're experiencing audits now from this management assessment has lasted one week and they'll be back in two or three weeks to do it again. And, they've interviewed every single management person in the system within DOE.

We also have monthly TPO meetings where Carl has all of his managers at and we spend one or one and a half days in discussions where we focus on the technical work, the regulatory work, as well as the cost and the schedule and the financial management.

Finally, as an aid as a management tool, we apply total quality management concepts. We've been involved with the Federal Quality Institute on that. We've had a number of
1 seminars. We've had people from industry come in, give us
2 lectures and seminars and lessons learned on how they apply
3 those circles. We have our own quality circles. They are
4 making changes and are streamlining things or are addressing
5 things from within the management system that aren't working.
6 So, I would not want to leave you with the idea
7 that's there's not a plethora of management tools that we use
8 every day, every week, and every month. They're effective
9 tools. We've got records. We've survived the audits. We're
10 not blown away by any of these audits. We do well with them,
11 and so far as I know, almost always we come back--we receive
12 information back in letter form that compliments the ability
13 of our records system and our management people to account
14 for the work and the cost.
15 DR. CANTLON: Thanks, Max. Let me just make a comment.
16 What we're talking about really is a combination of two
17 questions. One is how well is the OCRWM program system
18 optimized as opposed to subsystem optimized. That's one
19 question. And, what management tools do you have to make
20 certain that the system management rules, not the subsystem
21 management.
22 Now, Max has just given an iteration, almost mind
23 boggling, of the management tools to look at the subsystems
24 and to make sure that every nickel and dime and decision is
25 in place. Those of us that come from university life have
just lived through a couple of years of really tough interaction. We've got a guy named John Dingle who has made a career out of pointing out that overhead rates of 50% are obscene. Well, now, we're looking at a project in which the scientific operation is about one-fourth of the cost. In other words, if John Dingle were here looking at your indirect costs, the universities would be going scott-free.

Now, what we're looking at--

MR. GERTZ: I just need to interject a touch. We have been reviewed by Mr. Dingle's committee and we've gone through our cost control system.

DR. CANTLON: I understand. But, what I would say is that we have an opportunity now and our Board and this panel have an opportunity in putting together this specific report for entering a situation in Congress and with the change in the executive in which the efficiency of the operation of the Federal bureaucracy is really going to be a focal point from both places; the Federal Government isn't working very well. It's costing too much. We've over-regulated ourselves. It's like the medical system in this country. We have essentially designed our system to protect ourself from litigation and litigiousness rather than getting the work done. And, here, we have a group of scientists and everybody has said the ESF is really a scientific machine. It's a scientific facility to find out what in the world is going on
in that mountain that will make a difference in putting the
repository together.

Now, the question is have we so overburdened this
system to make sure that every auditor is content and happy
and go home claiming credit for having done things, have we
done that so severely that we now have a trickle of work
going out to ask this fundamental question which is critical
to this nation's future energy policy?

So, that's really the context in which I raise the
question and I think we've got to really address that with
more vigor.

MR. CLANTON: Once again, there's no free lunch. And,
when G-Tunnel was closed, again the attempt there was to save
as much of the staff as possible. We realized when we shut
it down that there would be some hits through the labs,
through the GS, but realized that most of that hit occurred
in the contractor, in the REECo area. The cost of keeping G-
Tunnel operational and not doing any work in there, but just
where it could be worked was $3 million a year. To do any
work at all in there and to do the ventilation, the environ-
mental cleanup, we would be 5 million plus to continue to
work in that facility. And, rather than spending that money,
we saved as much as we could, put it back into the labs, but
yes, the labs did take a hit. Someone would have taken a
much larger hit in some other programs had we kept it open.
Thanks.

DR. CANTLON: Thanks. Jim?

MR. ALLAN: I would just like to reinforce your most recent comment with an example. In June of this year, I had the opportunity to accompany Robby Robertson and several other staff members on a tour of three different countries in Europe to look at their programs and procedures. And, that's one thing that was made very clear to us, the fact that one of the major differences in those programs, as compared to ours, was the fact that our society does require in this country a major effort simply to protect ourselves from ourselves. And, they recognized that, and in one case, they made it very clear to us that you folks over there are causing us a lot of perception program back here at home. So, what you say is real in the eyes of our compatriots across.

DR. CANTLON: Carl, you wanted to--

MR. GERTZ: Let Russ go first.

DR. CANTLON: Oh, okay.

DR. DYER: Okay. I'd like to agree and disagree with some of the things that have been said before. First off with Uel's comment, yes, we did retain scientists, but like Tom Statton said yesterday it's not because we're a welfare program. Those people were moved to other projects. We're not the National Science Foundation.
We have a discrete set of investigations to conduct and questions to answer. We can't do all of it at once. We have to reallocate depending on the circumstances and that's part of the frustration is that circumstances seem to always change. I think part of my frustration and certainly Larry's frustration is that if--I suspect Carl is going to show a graph in a little while that will demonstrate this--if you look at the technical staff on this project who are also the front line of communicating in the Outreach Program--Larry's people, Dale's people--these are the people that need to communicate with the public, with the oversight boards. We're pretty much--we feel we're overburdened, if you will. I'm sure that many of Larry's people would prefer to be doing most of their work in a lab instead of spending one or two days a week on public tours communicating with the public; yet, that's also a very essential part of this project. And, part of the frustration is that--I guess, I'll take a middle ground here--I sympathize with Larry somewhat, but also this is a large project which has many facets to it and it's really hard to keep all the balls in the air at once.

DR. CANTLON: Thank you, Russ.

Let me just say a couple of logistical things. We want to break in about, oh, seven minutes here to go to lunch and we're going to convene at 1:30 rather than the 1:00 o'clock or 1:15. So, let's convene at 1:30 for the wrap-up
discussion. So, you're setting the stage.

MR. GERTZ: Right. We'll be back at 1:30.

DR. CANTLON: Yeah.

MR. GERTZ: And, let me just reiterate what Larry said and Russ, you know, I keep this chart because while I agree with what Larry says, there are a lot of science--

REPORTER: Microphone.

MR. GERTZ: Microphone, thanks.

DR. CANTLON: I would just say remember the buffet luncheon is--if we get in there at 11:45 we can get through and out.

MR. GERTZ: This chart shows what Larry was talking about. That's the scientific. That's millions over here, a total cost per year on one of our schedules, and the science is not a big driver, but it's one of the drivers that requires an ESF and ESF support. There's payments and oversight for the state. There's repository waste package.

We've not even talked about part of our responsibility is design a waste package, an EBS, you put it in your fifth report, and design a repository. So, it is a multi-faceted program with lots of demands.

The question you ask maybe starting out is how do I make my tradeoffs in those demands? And, we really go right back down to a couple baselines. But, first of all, let's remember the entire program is regulatory driven. We're
1 answering regulatory requirements. Our basic regulatory
document is the SCP which requires a waste package design, a
repository design, and a plethora of scientific studies in
order to answer questions. Not just to answer science, in
general, but to answer questions. That plan is our baseline.
We put it out. It's been reviewed. We know it's 6,000
pages long. NRC, EPA, USGS found the site plan to be
adequate. Detailed study plans follow up and we go ahead and
lay out our process for that.

DR. CANTLON: Before you leave that, Carl, that essen-
tially was true until the 1992 Energy Act passed. Do we now
have an opportunity maybe to simplify?

MR. GERTZ: We have two opportunities to simplify the
plan. First of all, I do not know what the National Academy
will recommend and what will come down and that will change
our final plan. No doubt about that. But, there are con-
trols in place to revise this plan as it is right now. Right
now, we're looking at elements of that plan we'd like to
eliminate. Larry's people have taken the lead in erosion.
There's four studies we may not need if we can solve the
erosion. Volcanism may be another area that we'd like to
reach issue closure. But, there is a formal process and we
can't just arbitrarily pull it out of the plan. We've got to
do an analysis, meet with the NRC, and then remove it from
the plan. That plan will change probably by the existing
law. It will also change as we gather data. It's an interim
2 process.

But, how do we make our tradeoffs? This is back to
our project control that I alluded to a little earlier and
I'm just going to expand on it just a touch. We have a 15
6 element work breakdown structure that goes down to the 4th
7 level and I'm going to expand on geology which is under
8 1.2.3. All these elements down at a lower level have cost,
9 schedule, and work scope tied to them and milestones not only
10 for the next year, but for the next nine years. And, if you
11 expand on geology, it will go down to work breakdown struc-
12 ture and some of you have seen this before. That's the
13 project.

Russ Dyer is responsible for site activities. Uel
15 Clanton was responsible for 1.3.2 and then it goes down--we
16 have three contractors that happened to work in that area;
17 RSN designing, engineered structures for the scientists like
18 Rick Spangler to do his tests, and REECo constructs the
19 trenches and stuff, and they all have their own work scope
20 and activities. And, Rick Spangler, you've heard him talk
21 before. He then has other PIs and himself who do some of the
22 activities and each of these at this level in the summary
23 account. This one happens to have 10 activities with a total
24 cost of 521; 14 activities with 100k. Maybe those activities
25 aren't open next year. So, that's why it's so small. But,
the whole work is laid out, scheduled.

And then, when I give people their budget and they say, gee, I was supposed to have 500,000 next year and you've only allocated 200,000, here's the things I'm not going to do in the schedule. And then, I have to accept that or reject that or find them funds to do it and then replan the schedule. So, when we allocate the budget, the process that we go through is just one of looking at what we planned to do, what effect will it have on critical paths, what effect it will have on scientific tests, what effect will it have on our oversight boards.

And, as I said, I could show you and you know they exist, the planning packages. They list the deliverables and when they're due and what's the scope of it. It's almost like a contract we have with everybody working on the project. Someone is responsible both from the contractor side and from my side.

So, that's how we kind of manage the project and that's the tools we use to make tradeoffs at this level.

Now, how John Bartlett makes his tradeoffs, I can't respond to those. I participate in some of those discussions. It's not as formalized as this by any means at this time. Robby can tell you about how the M&Os look at systems tradeoffs and what kind of containers are appropriate and should we have a multi-purpose container or canister and how will that work in
the system. But, regardless of those decisions, there's still a basic amount of work that needs to be done and I believe including getting a ramp down to the repository horizon.

So, that's how we focused this year's activities.

DR. CANTLON: Where does the M&O operate in this sort of overall optimization?

MR. GERTZ: Okay. They have--I guess I don't have that chart. But, first of all, for the work they do, they have their own accounts. Much like USGS, they have their own accounts. But, back to my other chart, they aid in the analysis of all these results, aid in monthly meetings, aid in helping suggest to us how the program should be focused. I pointed out, it is a Federal decision, but the M&O provides us the support, the backup, the analytic capability to analyze variances, analyze priorities, provide those recommendations to the Federal team and the Federal team makes the decision.

So, for the work they do, be it level of effort meaning people just doing activities and discrete work they do producing a repository design, producing ESF design, they're all in this system. Every dollar on the project is in this system one way or another.

MR. BLANCHARD: Carl, put the viewgraph of the WBSL up.

There's a management account at the top line and the M&O
1 doing management and integration for us writes their work
2 scope, their milestones, or we write them in and accept them
3 and fund them.
4 MR. GERTZ: Coordination and planning.
5 MR. BLANCHARD: It's like 1.2.4.1, 1.2.3.1, that's
6 management and integration. We charge to that, the M&O
7 charges to that, and some of the TPOs may charge to some of
8 that.
9 MR. GERTZ: But, it's a fairly structured process
10 because our milestones and deliverables are laid out. It's
11 based essentially on the SCP and what we decided was--how we
12 were going to answer those questions in the SCP.
13 DR. CANTLON: All right. Well, we'll return here at
14 1:30 and continue the discussion.
15 (Whereupon, a luncheon recess was taken.)
AFTERNOON SESSION

(1:30 p.m.)

DR. ALLEN: Okay. In this afternoon's wrap-up session, what we're going to try to do is to ask people to summarize their opinions, particularly on this general topic of the optimal integration of the testing and the construction for the ESF. And, the plan that we've devised is that I'm first going to ask the four consultants to the Board to offer some of their opinions. Then, Ed Cording is going to summarize the opinions of the sub-panel here, such as it is. And then, I'll turn to Bill Simecka who was going to talk just before lunch anyway for some—not necessarily final comments, but summary comments. And then, turn it open to everyone here including other members of the Board, staff, or any people, particularly those who have been lead speakers or lead participants in the function, but not necessarily limited to those. Anyone else who wishes to make a final or summary statements is certainly welcome to do so. But, I think it might be fair or appropriate for you people to hear from our consultants first to give you some opinion of where perhaps we stand and what you might be shooting at.

So, let me start off by asking Hugh Cronin. Hugh, would you perhaps make some summary statements?

MR. CRONIN: Yes. Thank you, Clarence.

I'd like to start off my comments with seconding
Joe Sperry's observation that I've learned a lot I didn't know before about this program in the last day and a half here and I think probably one of the biggest things I've learned is just how complex it is and how little I fully appreciate all the various ramifications. But, with that disclaimer, let me go forward and give you my very simple observations.

My first is that a smaller tunnel than the 27 foot currently contemplated would certainly be beneficial in many respects: the first being cost; the second, scheduled production; and, the third, safety. I think all those are major concerns on my agenda.

The second is in the area of contracting practices, management, however you'd like to classify it. If there is a way that incentive contracts could be worked into any of these construction contracts, in particular, since that's my area, I know that you would be gratified by the results at the end of the day.

The third is it's quite obvious to me that schedule optimization is the key to this whole program. And, whatever has to be done and needs to be done to improve on the schedule of the work has to be probably the first criteria.

And, finally, the test area, I think it deserves a very careful consideration to a reconfiguration of the test area in order to use some kind of a tunnel boring machine to
1 excavate all those areas. The nine months currently contem-
2 plated to build, as I understand, 9600 feet of test area is
3 just not the best use of your funds.
4
5 Thank you.
6 DR. ALLEN: Okay. Next, Joe Sperry?
7 MR. SPERRY: Yeah, I just have a few points here. Some
8 of them are going to duplicate what Hugh said.
9 I suggest that you consider using a smaller tunnel
10 boring machine and to complete the loop without stopping.
11 That first loop down the north portal and across the reposi-
12 tory and up the south portal, do that without stopping, do it
13 as fast as possible. Compared to a 27-1/2 foot machine, an
14 18 foot machine is going to excavate 20 to 25% faster. Now,
15 we've heard some discussion about there's a lot more cutters
16 to change on a bigger machine and I'm convinced it's 20 to
17 25% faster.
18 That's without considering the other risks that are
19 involved with a larger tunnel boring machine. And, I don't
20 know if you want to look at risk, consider more rock support
21 as a risk, but you're going to have more support in the fault
22 zones. I don't personally think you're going to have a lot
23 of trouble with the fault zones, but they're going to take
24 more time to excavate the bigger tunnel you're in. Your
25 pattern rock support, I would recommend that you look at a
26 four bolt pattern in an 18 foot tunnel. I think you're
1 surely looking at a six bolt pattern for a 27-1/2 foot tun-

er.

3 In addition, you run the risk of additional main-
4 tenance on the larger machine and I won't elaborate on that,
5 but we can discuss it some time if somebody wants to. As I
6 mentioned already, it's going to take more time to check the
7 cutters and to change the cutters. You are in a hard rock.
8 This is much different, as far as cutters go, down in the
9 Calico Hills. But, you're in a very hard rock and it's not a
10 short jointed rock. It's going to be hard to cut this rock
11 in the Topopah Springs.

12 Larger machine, the more risk of contamination you
13 have from spills. This is all the spills that you have; the
14 heat exchanger, water, the hydraulic fluid, the water in the
15 scrubber, all those are larger reservoirs, higher quantities.
16 If you spill, your quantity is larger.

17 You also have a schedule risk and you can--you
18 know, when things go wrong, it takes longer to correct them
19 on a bigger machine. It takes longer to assemble a bigger
20 machine, to move it around. Okay. So, to summarize that
21 one, I strongly suggest that you consider a small machine, an
22 18 foot machine.

23 We talked about rail haulage at some length yester-
24 day and I won't say much more about that. Just to reiterate,
25 use rack-rail haulage. It's done extensively. You have a
A lot of experience in your M&O organization on rack-rail haulage or knowledge of it and it's there. It's going to simplify your life a lot.

A third point, minimize this ventilation. Now, I have one set of calculations on the ventilation from UNR and so I've been able to look at those and analyze those a little bit. My idea on ventilation, what I would recommend to a client is if you want to operate one tunnel boring machine and one drill and shoot operation, I think at 600 feet per minute ventilation velocity—which is what you're designing the tunnel diameter for—I think you need a 17-1/2 foot excavated tunnel. If you want to operate two tunnel boring machines and one drill and shoot operation which I don't think is necessary, but then you need a 19 foot tunnel. So, I think you're somewhere around an 18 foot tunnel as a good, economical, practical size.

And, there's a terrific risk here. It's the scientific effort that's accomplished during this initial excavation. And, I don't understand the scientific effort that's required here and perhaps I haven't listened well enough. But, anyhow, I understand that water sampling and fault probing and putting in some instruments to measure the moisture in the faults is necessary and I say fine. But, it seems to me that should be a maximum of some fraction of a delay per incident. I can't see that this should be a big
1 delay. And, by setting some ground rules like that, you'd certainly minimize your risk.

I don't think there should be any delay for geo-logic mapping. We haven't heard much about how extensively that's going to be met. We map all our tunnels today, in general. Maybe, I shouldn't say all, but generally when we build a tunnel, we map it. And, this is a fraction of a shift per week when the tunnel is going well. Maybe up to a day per week, if it's going exceptionally well, but there shouldn't be a lot involved. But, there again, I don't know the level of mapping that you require. But, it shouldn't be allowed to delay the excavation.

I think that you should redesign the main test level for a mechanical excavation method. My suggestion would be then you're going to procure a tunnel boring machine and that's going to start pretty soon. While that tunnel boring machine is being fabricated, I think you should be designing your machine that's going to make your turnouts and also excavate your main test level. Then, while you're excavating with the tunnel boring machine, your loop, you could procure that machine. And then, after that loop is excavated, after that's complete, then put the machine in and excavate your turnouts, your alcoves, and your main test level. And, I assume that you'd do the main test level first, but you need to design it and configure it for mech-
And, I hear some ideas around the room on how to do it. I presented an idea. Jim Friant seems to have a better idea. But, you know, get these ideas together. But, you have to design what you want in that main test level. Then, make the machine do the alcoves, the turnouts, and the main test level.

It's a method of doing that. Maybe, you can take the tunnel boring machine that does the first loop and make some minor modifications. Maybe, you have to put some extra hydraulics on it. Maybe, you have to put some vertical grippers on it. But, it doesn't have to be a whole new machine. It's just a method that you have to come up with. There's a lot of talent in the group and I'm sure you can come up with a great method to do it.

I guess the last thing I want to mention is this--as you negotiate the award business of your contract and I'm not the expert at that business, but it sounds to me like you can have a lot of--I read just a little bit over lunch, the RFP you put out. There could be a lot of contentious discussions on trying to negotiate that award fee every time.

It seems like a disputes review board--you don't have to get fancy with a board. It can be a one man thing if you can both agree on the one person. But, that could help you a lot and I would suggest that you consider a disputes
review board. The partnering, it seems to work. You should also consider that. I feel more strongly about the disputes board.

Thank you.

DR. ALLEN: Thanks.

The next, Bart Bartholomew.

DR. BARTHOLOMEW: Well, thank you, Clarence. I'm not going to echo, I don't think, too much what my predecessors have said; although my views, in part, are very similar to theirs.

Regarding tunnel size, I'm really not going to comment on it particularly except to say that I was surprised at the size of the tunnel that's being proposed. Considering the fact that this is essentially an access tunnel for exploratory purposes, tunnels of 25, 27 to 31 foot in diameter are very surprising to me. I heard the arguments on both sides of the issue. No doubt that's going to be resolved one way or another. It probably largely already has been resolved. Nonetheless, I just would like to register my comment that that does seem to be an excessive size for exploration considering the budgetary restraints and other problems that face you. Certainly, everything that Joe and Hugh have said, I think, regarding tunnel size are true. With a bigger machine, there is more risk of a main bearing failure. It takes more time to change cutters. There's a
greater potential for delays for that reason. Certainly, the tunnel is more difficult to support, and if you do have trouble with any of the fault zones, it's just going to take longer to get through. Having said that, I'll leave that subject.

One primary concern that struck me was the one of construction phasing. I understand the desire to develop the test area just as rapidly as possible so that the scientific tests can get underway. And, I understand the desire also of the project to eliminate risk. I've got to say that purely from a construction standpoint, I see great risk in the concept of starting to mine the laterals, mine out the cross passages concurrently with the main TBM excavation, completing the first loop. That just does not work very well. There are many problems that ensue; particularly, when you consider the fact that there may be shutdowns for scientific tests mixed up with the conflicts that are inevitably going to arise when you have a second major excavation operation being fed into a heading that is actively in progress.

It seems to me in looking at the schedule that, regardless of what machine size that you eventually choose, that if you procure one machine--and I certainly subscribe to the idea of going out and getting a machine underway just as rapidly as possible, the concept and the plan of involving the group that is eventually going to be the tunneling sub-
contractor in that procurement process at the earliest possible time. We certainly subscribe to that. That's all very sound thinking.

Once that machine is underground, however, it would be my view that everything that should be done that is possible to do to maximize the advance of that machine so that that loop can be completed at the earliest possible date, understanding that there is a need for certain scientific tests, certain tests of opportunity that can only be done at that time and certainly to the extent that those tests are necessary, there will have to be shutdowns to accommodate them. Even with those occurring and provided that they don't turn out to be too expensive, it would seem to me that with any reasonable size machine that it would be possible, if you do not hinder the operation, slow down the operation by starting anything else of a major excavation nature back behind the machine until the machine has completed the loop, it would be possible to mine out the loop in about a year. Now, that would be predicated. It would take advance rates of somewhere—an average rate on a five day week of something like 100 feet a day which I do not think would be an unreasonable expectation in the kind of ground that you apparently are in.

My view, once that point is reached and that machine pulls through, is somewhat different than my col-
1 leagues. I would think that the thing to do at that point
2 would be to utilize that machine, particularly if it were not
3 an unreasonably large size, for the access to the Calico
4 Hills formation and to count on procuring a separate indepen-
5 dent piece of equipment to mine the laterals in the Topopah
6 Hills formation and to mine out the chambers for testing.
7 You'll have about a year after the first machine goes under-
8 ground to perfect the design and to obtain a properly
9 designed TBM, which I would lean to.

10 From what I've heard from several persons the last
11 couple of days, I think it certainly would be feasible to
12 develop a short main beam machine that would have the capa-
13 bility of making the right angle turns much more readily than
14 a standard TBM. To procure the machine with that in mind,
15 that second machine would then do the 9600 feet of lateral
16 tunnels and chambers. Certainly, concentrating on the test
17 area first and then moving down to the other two chambers.
18 The machine could then eventually be used for that same
19 purpose in the Calico Hills formation or it probably could be
20 done by a road header, as well. But, the machine would be on
21 hand and would be a natural thing to me to use it for that
22 purpose, as well.

23 I, thus, would visualize one TBM operation until
24 the loop is completed. Then, starting the second TBM opera-
25 tion to the Calico Hills formation, but through a separate
portal. And, I thought that the idea that Joe presented yesterday had a lot of merit. It would have to be modified, I understand, for the scientific reason that you want to have the footprint of the alignment of the lower tunnel directly beneath the upper one. And, my belief is that that alignment could be adjusted so that would be achieved. And, also, the other objection where it completes the loop coming back in to the main drift from the Topopah Hills formation, that could be altered so that that intersection of completing the loop in the lower tunnel is back up in the ramp area for the upper tunnel.

So, what you would have is that the second main ramp excavation for the TBM would be occurring at the same time that the specially adapted machine is operating in the upper formation with the lateral tunnels and the chambers for the tests. I think it clear that the configuration of those laterals and the test chamber will have to be given thought and undoubtedly designed to accommodate what can be accomplished with a short radius TBM. The configuration that appears now apparently is a very old one that was visualized to be what might be required if access was by shafts. I understand that there's a lot of flexibility in how that could be done and there is time, of course, to make those studies and to get that configuration laid out that would fit a TBM operation.
With the modified TBM doing the 9600 feet of laterals, even though you do not start it until some seven months later than your present schedule indicates that those laterals would start, with the faster capability of doing the laterals and the chambers, you would complete all of the excavation work necessary for the scientific excavations at about the same time or perhaps a little bit earlier, actually, than what you show in your schedule now in my view.

Finally, with regard to contracting arrangements and commercial terms, I'd simply like to reiterate on my earlier expressed view that certainly, although contractors I think tend to often prefer fixed price contracts, I think they feel that generally where the scope can be identified that that's the greatest opportunity they have to do their thing. But, clearly, in this case, the work is going to have to be done under some form of a reimbursable cost contract. No question about it.

I would prefer to see you find some way--and, I'll just characterize it that way--to find some way to create within the cost reimbursable framework a mechanism where you really provide a goals oriented incentive to the contractor that can be measured in terms of reaching a certain objective by a certain date and achieving it at a certain cost level based on mutually agreed estimates with the participation and overruns and underruns in that estimate that would benefit
the contractor or that could penalize him to some extent in
the event that his performance did not come up to expecta-
tions. Broadly speaking, I think that would summarize my
view on the subject.

One last thing I just thought of. I do subscribe
to the rail concept. I think that certainly from the stand-
point of mining operations, safety, lack of interference,
control, that a properly designed rail access system, even
though you're using conveyors for muck disposal, would be
much superior. And, I would think also that it would have a
very marked advantage or the ability to safely regulate and
control traffic in the underground work during the scientific
investigation phase.

That summarizes my view.

DR. ALLEN: Thank you, Bart.

And, finally, Bob Matyas.

MR. MATYAS: I'd like to share with you my own observa-
tions of the last two days in the management systems area.

As I said earlier today, I'm positively impressed
with the amount of talent that's on this project. I'm
pleased to hear that you've got effective management tools in
place. But, I'd like to offer you some suggestions or chal-
lenge you.

I think that you ought to consider examining the
very complex management matrix that exists here. Not unlike
the General Motors organization that's going through at the moment, I think it might be a good exercise, whatever the result, if for no other reason, to give you a cleaner perspective on it and perhaps relieve undue anxieties in your day-to-day work. For example, I'd like to see the DOE assume the role, which I've seen them in earlier days when they were called AEC, wherein they collected, they sorted information, scientific data on the facility, and they did one thing very important; they took all these data and they converged them and then they flowed them to an M&O. The M&O then goes out and has the work executed from both a design and a construction point of view.

To the M&O, I would urge you to delegate authority to the lowest possible level. I also suggest, because of the complexity of this situation and just the history of it, an M&O might want to look into, if you don't already have something, kind of an executive review board that serves management on a continuous basis. The M&O, of course, executes through the construction group, REECo and their subcontractors.

On the matter of contracting, I believe that there are some contracting practices that were developed in the 70's and the 80's by the USNCTT. It's a tunneling technology committee of the National Academy. There's some excellent contracting practices that are given in a group of publica-
tions. I suggest to you at least look at them and see if there's an opportunity to refresh your contract; not just the contract that you're about to release, but other acquisition devices and strategies. I believe if you at least go through these exercises, if only intellectually, that you may have a yield in less absorption of critical budget dollars into indirect areas, releasing more of it for the main mission of this project, the scientific mission.

And, another thing occurs with a large, complex, almost arthritic system—I don't mean that you're arthritic, you're still working and producing—but, there's a creep that kind of builds into the time for execution of things. The things I've heard in the last two days are on the longer exaggerated side of what I have experienced it takes to do underground construction. I think you're on the high end of the number of weeks and months it takes to do some of these things. Now, given I'm not at all knowledgeable about the constraints and various parameters you have to deal with, but for what it's worth, that's my observations.

Thank you.

DR. ALLEN: Thank you, Bob.

And, now, Ed, if you'd be willing to sort of summarize for the sub-panel.

DR. CORDING: I was going to talk about my background in instrumentation, couldn't handle it. Mechanical engineering,
and that's another interface that's very important, we find that the geotechnical part of the project and the mechanical engineering of the machines and all, put those together right and you might be able to do the project right, but you also are always predicting what's going to happen. And, so being able to be on projects over the years where you see the results of your predictions is a very humbling experience. 

As a graduate student, I started out wondering why all these people couldn't figure out what the problem was and get it done right and realized that it's easy to look at things after the fact.

So, underground construction to me is a fascinating area and we see so many things underground that are not--in fact, I think almost without exception, we find things underground that we did not anticipate. Some of them may be major problems; in other cases, they're relatively minor. But, we do see something different. And, the Ghost Dance Fault, we've all got a view of what that's going to look like. It's going to be somewhat different. No matter what view you have, it won't be quite the same underground. So, that's one of the reasons we, as a Board, have been concerned about getting underground early and seeing what's there and improving the models and being able to understand how the parameters that we see underground fit into the models and the testing that needs to be done to understand it gets done.
1 A lot of it, I think, is a matter of getting down there and
2 looking and then we note that there are some high priority
3 tests and the heater tests have become of even more impor-
4 tance than they were several years ago in terms of finding
5 out what's going on underground--excuse me, finding out what
6 the behavior is under the thermal conditions that could exist
7 in the future.
8
9 So, I see that as somewhat of a--there's some
10 change in emphasis here as to what high priorities may be in
11 an exploration underground. And, one item, I would say, is
12 that there needs to be some continued work in defining some
13 of those objectives. I think that is leaving up in the air
14 at this point some of the directions that one goes in, in
15 terms of, almost literally, the direction you go and in terms
16 of; where do you start the first cross drifts, and where do
17 you go in to find out the information? Do you go for the
18 heater tests as a prime priority or are you looking to get
19 across certain faults?
20
21 We are very supportive of the effort to obtain
22 early access to the underground. We think that the schedule
23 you're on presently, you couldn't improve on that much in
24 terms of bringing it up much shorter. It seems like that
25 you're moving as rapidly as you can to the point of getting a
26 tunnel boring machine in place and we are much in favor of
27 that and supportive of it.
We are concerned, as we have discussed, about size of the machine and our own review of it would say that the possibility of being able to use rail, particularly the possibility--well, certainly, we think the ventilation requirements are such that even with more than one heading operating, that you could handle it with a smaller diameter tunnel. Certainly, though, the opportunity to get through the facility initially with a TBM and then come back in and do other work would even further reduce ventilation requirements.

I think my perspective, as I was going to start to say about instrumentation, it has my whole research technical life, educational, the work I've done at the university has been focused, a lot of it, on testing and exploration underground and we've done a lot of measurements and so we are always dealing with this interaction between the construction and the instrumentation. In some projects, we cannot stop the machines and we simply get targets of opportunity. In other cases, we have projects where we specified certain amounts of delays to be able to go in and do certain pieces of work. In other cases, we can work around it or put in instruments before we get there. And, so I recognize that interface is a very important point and certainly the science and getting the information is a key thing.

I do agree, however, that I think we're going to
1 get the science in the most efficient way if we can get
2 through the facility and establish the second portal. Get
3 the second portal in place and then the people can go down
4 and do the work as you free up areas of the project, so that
5 they can get into it. You'll free up those areas and you can
6 basically turn them over to them and at least make it access-
7 ible to the testers and not just to a few people coming down
8 in the accompaniment of the miners because you're in a mining
9 environment.

10 It would seem to me that one of the possibilities
11 is to come through the facility. As you come out the south
12 portal, getting through this perhaps in a period of a year,
13 stopping as you need to with a careful program worked out
14 with the science to find out what is there in terms of these
15 targets of opportunity, making that efficient so that the
16 project can get through. In some areas, coming back and even
17 putting in later perhaps even side drifts into an area where
18 you want to find out more about what happened to that water
19 back into the rock or put in more drill holes and things like
20 that.

21 But, the point I was making was that as you get
22 through and get through the south portal, as you come back,
23 one possibility then is you come back against your lifeline
24 and against the conveyor line and the support from the north
25 portal, collapse that back, and as you do that, bring in
perhaps the machines that can do the side drifts, and then to turn those over to the other experimenters. Perhaps, Alcove 8 could be on the south side of the repository. I'm not sure of exactly what your requirements are on that, but certainly you want to be in the Topopah Springs. But, that could be one of the early ones and that becomes a site for some experimental heater tests just outside the repository boundary. Coming back and perhaps the next priority is the main test level and moving in there and doing that.

I agree with the idea that's been expressed by the consultants of organizing the layout for tunnel boring machine construction. Certainly, a lot of the drifts that are laid out for shops and storage and those sorts of things can be modified. It may be that you have to have other systems to flatten the invert and to make some cross drifts. Perhaps some drill and blast would be appropriate there.

I do think that one point that is of importance to me in terms of my interest in rock mechanics and some of the testing that would be done in the heater test is that I would much prefer to see a TBM mined excavation for the heater test than one that's drilled and blasted because I think you're going to see much different behavior in the first few feet of the rock if you're in a TBM type shaped and excavated opening than if you had a more irregularly shaped drilled and blasted excavation. So, some of the priority test areas, we're
trying to understand the characteristics of rock for future repository, if it is licensed, that would have much of it mechanically mined. Then, it would seem appropriate to do that to have that opportunity in that main test level to do that type of work against the TBM mined excavation perimeter.

We've talked about the size issue. From reviewing the size, it would seem that using rail for the operations of the facility, as well as the support of the TBM operation, that you have an ability to move men and material in and out of the facility in a way that's even safer than putting in the wide roadways. And then, in addition, we've talked about ventilation. It seems that many of the things that we've heard about the requirements for the ESF, one could look at a smaller opening for that. We are interested again in seeing the project getting started.

For some time now, you've been talking about the 25 foot size and now it's gone up to the 27-1/2 to even to 31. There is a big difference even between--as you go from 18 to 25, certainly that's a jump. But, going from 25 to 31 is another significant jump, as well. And, I think that one needs to look at being as efficient as possible in terms of the size of this opening. In regard to fitting this opening into the future repository, you're trying to put it in a location that the future repository will be. It seems to me that you could look at over-excavation if one needed to
enlarge. I know that can be difficult to do, but there are
techniques available to do that. If we're talking about a
matter of a few foot difference where things could--not much,
but with one or two feet, you could accomplish many other
objectives and then you look at the larger size.

I think that the key thing at this point is to make
sure that we do get the project started, that it can go
forward, and the tunnel boring--to me, the size is not the
crucial overriding issue to the entire project. It's getting
the project started with good equipment and a proper approach
to the construction. But, it's something that we are con-
cerned with.

Those are the primary comments that I had and there
will be other things that Board members will be wanting to
discuss, I'm sure, later.

DR. ALLEN: Okay. Thanks, Ed.

I'd like now to turn it open to everyone and any-
one, but let's start with Bill Simecka.

DR. SIMECKA: Well, first of all, I would like to
express my appreciation for having these discussions. I
think that I've learned a lot and it will affect what we take
a look at. And, so I am very appreciative and certainly the
doors are open for anybody else that would like to call and
offer new ideas and concepts because we will use them if,
indeed, we can.
First and next, I would say that contrary to a view expressed yesterday, I've been viewing this ESF as truly an R&D laboratory. And, it may not be a laboratory that you can push things to destruction every place you want to do that, but I think within the block and the MTL we will have opportunity to do that. So, because we've accelerated ESF, I believe that we ought to make this our basic scientific laboratory and hope that we can conduct the necessary tests in the MTL.

To that extent, I believe we've got to provide as much flexibility as we can in the laboratory because I am not sure what we're going to be asked to do. And, the thing that I am most concerned about is to incur a major delay because the science tells us that we have to do something that I'm no longer able to support without waiting for something else to get done. So, I understand the reasons why a large diameter may be less cost effective, more risk, and et cetera, but I believe we ought to be very careful that we don't build a box for ourselves.

We will re-examine the ventilation requirements because, as you saw yesterday, the ventilation requirements are based on some assumptions. And, there were a lot of diesel-powered equipment in there. I'm going back to look at those assumptions to make sure that they truly do demand something in the 25 plus category.
Now, we have not settled on a rubber-tired set of vehicles. That was used as an input to the ventilation thing, but we have not settled on that nor have we settled on diesel-powered vehicles. There's an issue on diesel-powered vehicles that have to do with hydrocarbons and how it might pollute the underground. And, so we're not sure we're going to be allowed to use diesel-powered. And, further, I am very interested in the rail approach. We will look at the rail transport because of all the reasons that were brought up, safety being one of them. Also, transporting equipment into that 6.5% down ramp. Maybe rail is a better way to go going down there. I don't know, but we will look at that.

Further, we fully intend to use mechanical excavation wherever and whenever we can because--for a lot of the reasons that were discussed, I agree with those. As a result of needs for expediency, maybe we'll use some drill and blast. If we are allowed to reconfigure the test area to make use of mechanical excavation, of course, we will do that. If it's a complicated test that doesn't lend itself to mechanical excavation or it takes too long for a machine to be made available, we will go ahead with drill and blast because we need to get these tests done.

Now, we didn't get to talk about it yesterday, but there is some new technology that the Colorado School of Mines has been pursuing on a five inch cutter. And, it turns
out that five inch cutter reduces the thrust requirement per

cutter significantly for this hard rock. So, this lends

itself to--well, the reason it's being worked on is for
drilling, but those same cutters might be useful to us in
making road headers much more capable or mobile miners much

more capable for hard rock and we will be looking at those

because those may be able to be used for these alcoves and et

cetera. But, that's something we didn't get to talk about,

but it looks very promising.

And, finally, in response to John's statement about

sub-optimization, I can't leave without mentioning this. In
my view, we have been sub-optimizing on this project and the

basis for that view are two statements. Site suitability is

not system suitability and site suitability is not indepen-
dent of system suitability. And, therefore, we can't prove

site suitability before we've proved system suitability.

They must go together. And, the reason for that is it--the

emplacement of the waste significantly alters the ambient

environment. So, it doesn't do a hell of a lot of good to

examine the ambient environment if you know that ambient

environment is going to be altered significantly. So, there-

fore, I think we must give equal priority, equal vigor sup-
porting those things that we know will cause an alteration to

the environment and examine the performance of that. That's

why the heater test is so critical. I believe the thermal
loading option decision is super-critical for this project because it has tremendous ramifications on cost reductions or increased cost, depending on which way you go, for the repository design and construction and operation. So, I think we are—to answer the question about sub-optimization, I feel we are doing this and I encourage all of us to begin thinking from an overall system standpoint and not just in the sub-optimization areas.

Thank you very much for allowing me to summarize my views.

DR. ALLEN: Let me ask if there are other of the key participants, first of all, who would like to make some comments or questions. Tom, you raised your hand first, but—okay.

MR. GERTZ: I do, but I prefer to summarize at the end. So, just don't let me out at the end.

DR. ALLEN: Okay.

Okay, Tom?

MR. STATTON: Yeah, I had just a couple of things sort of sitting around after yesterday. As we talked over the lunch break, I felt like for a while yesterday we gave everybody a knob on the radio and somebody had the knob that was the AM/FM button and somebody had the gross tuning knob and somebody had the volume and the fine tuning knob. And, for a while there, I wasn't clear we were getting a radio station
that we could listen to and I thought maybe part of the message that we tried to convey didn't get across.

I, too, come from a little bit different background, Ed, where my focus is more on building things and my charter here is not that. And, I want to make sure, while I'm speaking for a softer part of the community, while I'm speaking for maybe the softer sciences here not necessarily focused on construction, that we not sort of lose sight of where we are. I know I tried that a couple of times yesterday.

But, by and large, we sort of plan our work and then we work our plan. And, we have an elaborate plan for an underground facility and for an underground testing program. We probably had, at the time that was constructed, every test known to man somehow organized and thought out and partitioned into what one might do in a maximum diet underground. Because of our costing considerations, we have to cost all that stuff. So, rather than saying what is the maximum one could ever think about doing, that maximum becomes the plan because the plan has to go into a cost control system. So, the sequencing of that plan necessarily wasn't worked out in the finest of details.

We're not working that plan, per se. We're looking at a '93 that's a very different '93 than the way that plan was initially conceived of and laid out. I think we've added
1 a phase to what the ESF is all about and that phase, I think,
2 is not inconsistent with some of the remarks we heard this
3 morning that an upper loop be constructed that provide this
4 sanity check on our understanding on the model of that
5 mountain. You know, we're not just telling the mountain to
6 turn its head and cough, we're crawling down the tonsils of
7 that turkey to find out what the inner workings look like.
8
9 First off, we need to sort of get our bearings and
10 say does the model we've conceived of have any truth in what
11 it is I'm looking at and I think our '93 plan suggests that
12 that's the way we're headed here. That, in fact, the idea is
13 to slow down the progress of that upper loop to the minimum
14 degree possible. There are clearly, as we talked about, a
15 couple of reasons one might need to stop, but by and large,
16 the program that we've laid out said we don't want to stop
17 either. The first thing we want to do is to take our little
18 walk in the woods and say what I see looks like what I
19 expected or looks like something within the bounds of what I
20 expected. So, I think the '93 plan, while it's not different
21 than our original elaborate plan, it is a subset and sort of
22 a Phase I that's identified and I believe it's consistent
23 with what the advice of the consultants have been.
24
25 I guess the only other thought that sort of came to
26 mind was we need to remember that this is an investigative
27 program and there are some peculiar things about an investi-
gative program as opposed to a prescriptive program. When I'm constructing a vehicle and I'm watching it work down an assembly line, I can count four tires and I can count seats and I can see it has an engine and has a steering wheel, and when I get to the end, I've got an automobile.

Here, we're working down an assembly line and we don't know whether we're putting tires on or wings on. We're not quite sure whether it's a railed vehicle or a boat and we need to be prepared for the kind of surprises you were talking about; that things don't look exactly as one might have anticipated. And, I think in large part there what that says is that planning in greater detail in the testing community than what we're talking about for the walk-through in the upper loop probably isn't appropriate right now. That what we need to be doing is sequencing the plan that we've written before in accordance with observations.

And, maybe that's a rather non-theoretical approach, but observationally I think some of the simple things need to get done first before we get into an elaborate sequencing of either test layout, test plan, or whatever. And, I think that the testing community, by and large, has taken that approach. I believe it has its act together in understanding how to sequence our first walk through the mountain and I didn't want to leave the impression that we have left some of those details from being laid out on the
Dr. Allen: Okay. Thank you.

Jim, did you have some comments?

Mr. Friant: I guess I have an advantage here in that I had all these other opinions expressed, all of which overlap mine, but not every one the same.

But, at any rate, just to conclude, I'm glad to hear people pushing about a loop which goes all the way through with a minimum amount of stoppage. However, I'm also sensitive to the importance of conducting those studies and also that the people running this program are faced with an unstable budget that could be renewed every year. So, for all I know, by the time this tunnel boring machine hits the bottom of the north slope, it will be decided that there's not enough money to do anything except throw up a quick raise for a second egress and begin to develop this test area. So, I think this idea of flexibility is really required.

I certainly agree with this idea of having sufficient size and sufficient ventilation to not work yourself into a box. I saw that ventilation study yesterday and commented to John. There's a picture shown of this 27 foot tunnel boring machine going up this 4.7 slope plus 44,000 FCFM to that machine. Now, if I'm backfilling this tunnel and I have a dirt road, I have—with 44,000 FCFM divided by
125 per horsepower, I'm only allowed 360 horsepower to supply that machine with, what, one truck or so up this steep hill and, frankly, that can't be done.

So, there's two ways to get better ventilation. One, make the tunnel bigger, but two, also think about ways of conserving the requirement for the air. And, again, a large percentage of the cross section of the tunnel is taken out by filling the invert and the ducts that we're going to need for return, two 88 inch ducts. So, if I replace that bottom with just kind of a low trestle, I get a considerable amount more area to pass air. I'm not emotionally involved either way with the size of the TBM, but I'd sure like to see that some flexibility is kept.

I am a real proponent, I must admit, of rail. First of all, the tunnel stuff coming off the belt is lousy backfill. You can imagine wheeled vehicles driving on that, the amount of dust that that would stir up with 400 or 500 feet a minute in the tunnel, and 25% quartz material that we're throwing around in the air just doesn't sound feasible. So, that means you're going to have to pave that and you're going to have to do it right behind a TBM. I've never seen that done, but we have proposed it--oh, sorry about that. I'm a graduate of the Robbins Company, class of '91. So, we never did it, but we did propose it and that requires a large, large bridge for this concrete or whatever paving is
being put down to be put down and then cure before anything
can run on it. So, it makes a whale of a difference in the
backup system.

Mechanical excavation of the test area, a couple of
people have said that that is favorable and I agree. And,
again, that's another means of preserving or conserving
ventilation requirements. There's short stubby TBMs that
have been mentioned and mobile miners. And, you know, that
our WIPP Program, by the way, invested in getting a tunnel
boring machine just to do 300 feet of tunnel to do the heater
studies on for the reasons that were brought up here. Prob-
ably, the most expensive per foot tunnel ever built.

So, that pretty much concludes except I'd like to
show you a couple of lines of data since this five inch
cutter was brought up. Everybody would like, I think, to be
able to take mobile miners or road headers and get into that
test area. I can show you that it looks kind of feasible at
this point.

Take a look at the second bunch of data down where
the spacing is an inch and a half in that range and you'll
see--this shows that to get a tenth of an inch penetration on
that small cutter was only around 8,000 pounds of force. Our
computer program estimated that it would be 20,000 pounds and
we were delighted to see that the effect of a small cutter is
really outstanding. We did some testing for HDRK up in
Canada. They have an Eimco with a four foot head on it and we will be putting these cutters on that and we're also going to do some endurance testing on it with an independent driller that we're working on a bid for right now. So, we're very excited.

Now, this really came from Uel's group and problem in order to be able to bore more rapidly collecting core and reaming the hole up at the site. This is just a real crude depiction and a real design is almost done. In our next phase, we will build and test. But, it uses the mini-cutters. Now, again, that one-tenth of an inch penetration at 65rpm means we--I want to back off there. There was one that was 075. It was about 8,000 pounds. That equates to 45 feet an hour on a 60rpm drill. And, if we put six cutters at 8,000 pounds apiece, we've got enough weight to do that. So, this gizmo will pick up the core that's being cut, will ream this in one operation. We will blow air down this way and suck the material up this way, bringing out the cuttings. And, bring out the core with a wire line, so that that bit can stay at the face and never have to be pulled. And, these cutters will both cut core and ream in one step. So, we're really excited about that.

DR. ALLEN: Okay. Thank you.

Ray, you've had your hand up for a while.

MR. BULLOCK: This is to set one thing straight. There
was several remarks made about using mechanical excavation in the main test level. By the way, this was baseline in the project. Title I ended with a mobile miner type machine excavating the MTL and this was still baseline in the project. So, they have thought about that before.

Secondly, if DOE and the project does decide to go straight through the mountain with the U-shape excavation, it makes Busted Buttes all that more important because that heater test has got to get started.

Thank you.

MR. SMITH: Dr. Bartholomew really covered very well, I think, in detail what should be done and what should be done as far as tunnel boring size and optimization of the machine. But, there are a couple of things I'd like to just reiterate. It's the interferences in tunnels, they're external to your testing. Drill and shoot interference, as far as the conveyor belt operation to the high voltage cables, the conveyor, add significant delays. So, the concept of moving forward as rapidly as possible is, I feel, the best program.

The optimization of the tunnel boring machine in terms of bearing longevity and performance, I would say about 10 years ago in an equivalent length tunnel, it would have been more beneficial for the contractor to have run with two tunnel boring machines. The Calavaras (phonetic) Tunnel
which was done in '85 which is a Robbins tunnel machine was one of the first of the Long Beach tunnels. It was a large diameter machine with a very large bearing. So, in this case, it optimized; the machine performance is optimized to reach out into the last part of the job where the bearing reaches a critical point. Other components of the machine are reaching, you know, maxing out.

The very conditions on the tunnel boring machine--I was kind of equating this at lunch today. We go out on a cruise liner and we go out there and we have lunch, we look at the ocean. A tunnel boring machine is really like going around Cape Horn. It's a world that is just—where you're faced with—your machinery is taken practically failure on a day-to-day basis based upon the thrust pressures and the performance, you know, the activity that goes on mechanically with the machine. So, I feel that the optimization of size is very, very important within this realm of 18, 20, 25 feet.

The other thing that came up was in terms of design for the machine. For example, the curve radius. It's very important to identify as to the performance of the machine. For example, in Chicago, there was a 19 foot machine. She was handling a 210 foot radius turn which worked out extremely well. The first turn was a 90 degree. The tunnel machine went out 6,000 feet. The next turn was 90 degrees and it accommodated the system. You will be employing a
1 conveyor system. So, it would be much more efficient to have 2 your conveyed system and your curve radius be in balance. 3 So, that's an aspect of future design.

4 In the middle 70's inside a mountain for--it was a 5 hydrologic project headed by Duke Power. Everything was done 6 inside the mountain. So, the machine would back up, do 7 another corner, and then they'd move her up to another level. 8 So, you know, this concept has been done quite often. In 9 Chicago, the same problem. We have a 30 foot diameter tun- 10 nel, but our 10 foot machine is up in the crown. We in two 11 occasions are going to have to raise--after the tunnel is 12 completed, raise our 10 foot machine, the starter, in the 13 crown of the 30 foot tunnel. And, this has been done by 14 Healey on another project down there.

15 So, these are all--they're not state-of-the-art. 16 These are things that happen on a day-to-day basis. And, 17 we're in an industry that does a billion dollars worth of 18 activity a year and, hopefully, that in this managerial team 19 you've put together--for example, your M&O, Morrison-Knudsen, 20 has been a pioneer in this business and I just hope that you 21 don't kind of restrict the experience level of the contractor 22 because the need is to do the job in their manner and get it 23 finished.

24 Thank you.

25 DR. ALLEN: Thanks.
Yes, Larry Hayes?

MR. HAYES: Yucca Mountain is not isolated from the surrounding earth/science environment. There are a lot of issues that, going underground at the potential repository, issues that won't be answered. For example, volcanism, steep hydrologic gradient, mineral resources, groundwater travel time, a number of other issues that we have to answer in order to characterize this site.

I think that the majority of the scientific community supports getting underground, getting underground as quickly as possible. But, we don't want to do that at the cost of failing in our other activities. I ask the Board to consider the more Carl is pressed to get underground, the more he's pressed on schedules in a limited budget environment, the less he has left for these other studies. I know you're working very hard, Carl, to come up with a balance and somehow you have, so far.

My concern is this constant pressure to get underground, it seems a constant emphasis that underground is going to give us most, if not all, of our answers. That's very much of a worry to me because the underground facility, what we learn there, is only part of what we need to do and somehow Carl is given the task of funding everything without the funding he needs. I just ask that the Board consider what it may cost in other areas when you continually press to
1 get underground, get underground quickly, and so forth.
2          Thank you.
3   DR. ALLEN: Thank you.
4   Yes?
5   MR. PETERS: I appreciate that if we take apparently the
6 Board's recommendation that we go all the way through the
7 mountain before opening up any of the other areas that this
8 opens up a lot of different avenues for study, but our
9 approach was that we need to get into do such tests as the
10 heater test and those as rapidly as possible. I believe if
11 we go all the way through, we are extending that schedule.
12          And, I believe to do that, my estimates yesterday
13 may have been quite conservative in the 25% leakages and the
14 number of diesel units. But, to the area of flexibility, I
15 think we would limit ourselves if we take away the flexi-
16 bility of being able to drill and blast, to use diesel equip-
17 ment until we have truly identified other viable means to do
18 these things. Well, basically, I think we're dealing with a
19 question of flexibility and we talked a lot about risk. I
20 think that maintaining the flexibility to change schedules,
21 to change types of equipment is one way of considering
22 reducing risk.
23   DR. ALLEN: Thank you.
24   Steve Frishman?
25   MR. FRISHMAN: I'd like to make a fairly simple obser-
vation. There are a lot of things that I guess I'd be interested in talking about, but I don't feel sufficiently compelled to right now.

The last couple of days has been mostly talk of how to build the underground facility. What I hear at least from some of the Board members and staff is still considerable concern about what the underground facility is, what to build as opposed to how to build. And, I'd like to go back even one more step and maybe just issue a reminder that the real case that we're still facing is why we're building anything. And, Carl, yesterday I think faced that question and his answer was partly because the Board had said get underground, partly because the Congress said get underground. Well, the real reason that you're even doing this is because it is part of site characterization and a part and a part of site characterization that is required for licensing if you're going to go to licensing. It's also required if you don't make a suitability determination from the surface, you may have to go underground to begin evaluations.

Now, throughout its history, I think the Board has been building a more and more firm position and we heard it just as recently as about 20 minutes ago from Ed, that you must get underground and get underground quickly to get a handle on site suitability parameters and how these parameters affect some of the fundamental models. Now, what are
these parameters you're talking about? You're talking about things such as the nature and character of fault zones. Things such as how water travels through the fractures, as well as through the matrix of the rock. And, on and on.

There are a lot of fundamental characteristics of the site, many of which are at least partially and in some cases may be sufficiently observable from the surface.

Now, if you go and look at the approach that Russ took yesterday with his integrated test evaluation model, what you see is a prioritization of tests that speaks primarily to most of the characteristics and parameters that can be investigated at least to some extent from a surface-based program and maybe to a sufficient extent.

Now, what I'd like to point out is that the Board throughout time has laid out maybe not in great detail, but at least sufficiently I think for us to understand why you think getting underground very rapidly is an extremely high priority, and my thinking is following up somewhat on what Larry Hayes was talking about. You have laid out in very general terms why you think getting underground is very important and important ultimately to an early site suitability evaluation in an effort to at least maybe do a condemnation type survey.

Well, what I would submit to you is looking at the approach Russ took yesterday, which I think we have to assume
is a growing approach since he's in charge of the testing program to the extent that we're concerned here today, I think you're in a situation where you have to now say the Department of Energy in its evaluation of its test priorities and scheduling for testing, importance of testing for site suitability, regardless of whether for licensing or not, the Department of Energy has not given you a single piece of basis for your reason why you want to get underground early and very fast and move fast through the system. They haven't provided you with a technical basis to get underground to do what you want to do.

Now, I think this is critical in the sense that it's the Department of Energy's program and it's the Board who is to evaluate the validity of that program. Well, I would submit right now that your concerns should be much more for what the Department thinks are important tests relative to what you think is the reason for getting underground very fast. And, if the Department can't come up with reasons very similar to what you think are the correct reasons, then certainly your premise that getting underground very fast has a significant problem with its own validity.

So, I'll leave you with that thought. I think it's something of a challenge for the roles to be straightened out here, and if the Department can't provide you with a basis that you then can subject to an evaluation of validity, then
imposing your own basis and the Department not doing it
certainly is not a reason to get underground very rapidly.

DR. ALLEN: Yes, Ted Petrie?

DR. PETRIE: I just have a couple of things to say.

We've had a lot of good suggestions, I think, over the past
couple of days on ways in which we can improve our plans and
our techniques and designs, if you like. And, all of them
need to be considered. May I just point out to you though
that an improvement which is cost effective at conceptual
design may not be cost effective when you're in final design
and it will be less likely to be cost effective when you're
actually in construction.

As time goes by, I think we will always find that
there are better ways of doing the things we're doing. I
don't think I've ever been on a project yet where some
designers could not come in after we'd been working on it for
a couple of years--I could come in after a couple of years.
Sometimes, I've done the same thing and I could find better
ways of doing things, but at the time, what they were doing
is sufficient and is certainly okay and it's not cost effec-
tive to make a change. So, although many of these things
need to be evaluated, we may well find that some of them are
not cost effective at this time in our project.

Thank you.

DR. DOMENICO: We're all aware that in the early 80's an
1 awful lot of drill water was introduced in the mountain.
2 We're aware that there may be some perched water, as well.
3 And, so we're aware that some target of opportunity might be
4 the occurrence of water during the boring. And, I think I
5 heard the gentleman from Morrison-Knudsen say that some of
6 the shutdowns to test these target of opportunities may take
7 as much as two weeks. I think I heard that. Can I have a
8 little expansion on that? I find it difficult to understand
9 what would take two weeks, what sort of target would afford
10 two weeks for shutdown to do the necessary sampling?
11 DR. ALLEN: You don't know who made the statement?
12 DR. DOMENICO: A gentleman from M-K.
13 DR. ALLEN: M-K.
14 DR. DOMENICO: No?
15 MR. SPERRY: Is it possible that you can shut down for
16 two weeks?
17 DR. DOMENICO: That's what I'm asking.
18 MR. HAYES: Russ, correct me, but I know of no scien-
19 tific testing reason why we'd shut down two weeks. We're
20 talking about maybe a day.
21 DR. ALLEN: Russ, did you want to say something?
22 DR. DYER: Since I got referenced here, I just went back
23 and looked at my slide and I find for the unsuitability test
24 of the top 20, seven of them take place either entirely or
25 partially within the ESF. And, we have always recognized
1 that this is an integrated program. You need information
2 from both the surface-based and the underground program.
3 Anybody that's been underground, you can see things down
4 there that you can, at best, get hints of from the surface.
5 If you're trying to understand what the characteristics of
6 the underground are, there is no substitute for being down
7 there and being able to field a test in that environment.
8     DR. ALLEN: Other comments? Yes?
9     MR. SANDIFER: I would like to reiterate what Bill
10 Simecka said earlier about the rail vehicle consideration.
11 Again, the rubber wheeled vehicle approach is what's in the
12 Title I design. Our intention has always been to do a trade
13 study in Title II to evaluate rail versus rubber wheeled or
14 whatever. So, clearly, that's on our agenda and we under-
15 stand that.
16     Also, Bill Simecka pointed out yesterday an advan-
17 tage that the labs offer. The fact that we have this large
18 talent base that we can draw from and matrix to our project.
19 Clearly, that same advantage applies to the M&O
20 organization. For example, Fluor-Daniel to surface design
21 and M-K would subservice, very large talent pools that we can
22 draw on for the best possible people.
23     And, finally, this morning, there was some discus-
24 sion on our construction management organization. We have
25 had to bring that organization into a full functioning mode
in the past six to eight weeks. And, in part of that was a
review of what was required to accelerate the ESF and I'd
like to report to you that I feel that that has gone very
well. I think that organization is functioning precisely
like we had hoped. We don't have all the kinks out of it,
but certainly it's working and we've met our objectives to
date.

Thank you.

DR. ALLEN: Other comments?

DR. CANTLON: Well, since the Board makes its report
both to Congress and to the Secretary of Energy and since we
all know there's going to be a new Secretary of Energy come
January, it would be useful to us to get some input from some
of you about what kinds of opportunities exist to do two
things. One, to improve the total system optimization
approach which Bill Simecka addressed earlier. What kinds of
things would improve that dimension of the project. And, the
second one is that since the balance of the funds is so
skewed away from the R&D, per se, and is in this very massive
oversight, which I understand and I'm not--I'm critical of it
as a citizen and having to operate in the university, I know
the problem--but there does seem to be, if one listens to the
political rhetoric of the last six months, there seems to be
an intent on the part of the new administration to aggres-
sively press on that. I would also like to have some sugges-
tions about what this Board might say, might do in the way of using this DOE and this urgent problem as a way of taking a test case for improving the effectiveness and the responsiveness and the cost effectiveness of a Federal agency.

So, Robby, particularly on the systems area, I'd like to hear your thoughts.

MR. ROBERTSON: Let's see, this program has a long history, as I think all of you are aware. This is an odd M&O that we need to kind of understand. I was careful about my choice of language as to odd versus other, but in any event, classic M&Os are, in fact, the principal instrument of execution of a program under the guidance and direction and policy oversight by the Federal agency with which they're involved, whether it be DOD, or in this case, DOE.

Our M&O contract is different from most of the classic M&Os that exist at the moment. I think you observed the differences in the charts that Carl had up there. We are assigned certain responsibilities that are cross-cutting of the programs and are integrating. But, what's significantly different is that we have a large suite of what I will best characterize as associate contractors with us on this program. So, in the classic sense of, let's say, Westinghouse at Savannah River, we don't serve as the prime contractor for that function with these other contractors being subcontractors with us. They're all associate contractors. This
is a situation that has evolved over a period of time and I believe the validity of the relationship and use of RSN and the role that they were in and REECo and the role they were in, given that this is part of the nuclear test site and the staging of all of that and the labor pool and all, was a valid reason for having gone that way and evolved to this point. The heavy involvement of the national labs and the USGS in terms of the heavy intellectual content of this program adds another dimension that has to be dealt with.

So, we have inherited a particular situation. I, as the M&O, might have preferred the classic arrangement where you could say, you know, it's my nickel, it's my watch, you hold me responsible for the thing, and you know, if I do it wrong, then--you know, if the various players are not in the right mix, at least at first order, I have some option to do that. But, I believe the situation that we have here is workable. I think there's an evolving of roles. I think we also have to accept the fact that the M&O, where it is today is perhaps just beginning to reach a level of maturity both in staff and bringing itself up to speed on a program that has been underway very actively for over 12 years here, so that we're in a position to begin to do that integration.

I believe that if you look at the construct that Carl had with regard to Yucca Mountain--and, let me parch this into two pieces because I think it is important to
recognize that the M&O has responsibilities beyond just Yucca Mountain. We are doing the MRS work, we are doing the transportation work, and we are doing much of the system engineering integration, specifications, configuration management, and things on a program level out of headquarters. But, again, returning to Carl's project, per se, I think the construct under which he has laid it out up here is a workable one. You know, you may say it would be better if you could just beat up one person, but in fact, the way it's constructed right now is workable and I think the dual split that we have in the sense of trying to bring the program together in an integrated sense and yet execute certain line functions such as the design and the Title III inspections, that sort of thing, and the construction management support, give rise to a slight complexity of that. But, I do believe it can be worked.

I think that the frustration perhaps that I feel personally and that I know my M&O teammates feel is that we are going to be held accountable one way or the other. There's just no question in my mind if this program does not succeed successfully who is going to be first on the block. There isn't any question about that. That's already evident from the kind of political flack which we have taken as the M&O even in the early formative stages of this. So, you know, we are the big target and, regardless of whether we
I have the handle or whatever, we're going to be called to accountability.

I believe that the challenge that we have under the construct that we have here is that we're going to have to operate with a great deal of finesse in order to make sure that we get advice to Carl that he can operate on that is in the best interest of the program, that we can feel comfortable with that's going to get us there, and assist him in the process of communicating that and selling that in a persuasive manner on its merits to the rest of the participants in this program. I think that's the challenge that we've got.

I don't believe that we have been at a stage of either staffing or at a stage of maturity yet to where we can really say why haven't you integrated all this? I think we're arriving at that point now. I think the integrated kinds of looks that we've taken in like the 2001 exercise, I think in looking at the integrated schedules and linkage of all of that are important. I think we're beginning with Tom and his team to bring linkage between the site characterization program and the design functions that are on the other side. And, as we evolve the licensing strategies and the performance assessment strategies together, I think we'll further link those up.

So, I think that we don't have a perfect world. We don't have an analog. This is the first M&O for a program,
1 not a facility. This is the first M&O managed out of head-quarters as opposed to the field. So, it's odd in a number of constructs. So, I feel challenged by this. I think that we are up to it. I think we've got a good team. I think the associate contractors that we have here are, without question, in terms of the talents and the expertise that they have to bring to bear on the problem. The perhaps plea that I would make to them as a part of this process is to work with us, try to let the M&O be involved in those functions that will provide the integration and the glue. You do integration of large complex programs by that integrating entity performing certain crucial functions that allow that to happen. And, with that means that some of the participants will come back to their niche, technical capabilities, where we can, in fact, get them focused on their principal investigator roles and let us assume those roles of program integration and management support to Carl.

And, I believe, with that and the mutual respect that we have a good opportunity to make this succeed.

DR. ALLEN: Just one question I don't understand. If the project, the Yucca Mountain Project is not successful, you say you're going to be the culprit. I should hope that it's not successful. That is if it's not suitable, Mother Nature will be the culprit.

MR. GERTZ: I'll just defer one question. I think I'll
be the culprit.

MR. ROBERTSON: Yeah, Carl and I will be pretty close to the--except he's got a fallback for referring. I don't. I just type. But, I think the point if it doesn't succeed--I don't mean in the sense of--I don't characterize success as meaning Yucca Mountain is a suitable site. I mean, my definition of success is that this program culminates in a convergence of the engineering and science into some decisions that will allow us to systematically resolve this issue and then get on with life and solving this long-term problem of what are we going to do with this waste that we've got here. So, I don't mean it in that sense. But, if we fail for inability to control costs, for doing things that are perhaps inappropriate in the way of the overall system, and so forth, at first order, you know, we're going to be looked at the biggest entity to which that blame is going to be shifted.

DR. ALLEN: Other comments? Warner, you look like you're about ready to say something.

DR. NORTH: Larry had his hand up.

MR. HAYES: Just my view as to what might help Carl manage his program more efficiently. Each year, we develop optimistic plans. Each year, we don't get the budget we developed. We then spend a lot of time and energy going back, replanning, doing things partly here and there. Carl makes the best decisions he can to keep everything going, but
1 he doesn't have the opportunity to manage effectively by
2 doing what should be done when it should be done. That's a
3 yearly process.
4 It seems to me what I guess I feel, Carl needs is a
5 long-term budget. He's got a five year budget. He knows
6 what it is. He can plan to it. It seems to me that's how we
7 can effectively move ahead.
8 MR. GERTZ: I'm not ready to do my big time summary yet,
9 but I want to respond to John. I'm still listening. But,
10 John, in specifics, Larry hit right on it. There's one thing
11 I, as a project manager, would like and that is some kind of
12 certainty about funding and not being jerked around by the
13 appropriation process or the whims of Congress. I mean, it's
14 very difficult to plan a project. And, there is talk within
15 the Department of--and off-budget isn't the right word, but
16 revolving funds. There's $3.6 billion in the fund. It
17 earned more money in interest than we spent studying Yucca
18 Mountain. So, that's not, you know, an idea. So, that is
19 one thing.
20 Certainly, many of the others, we're trying to work
21 with in the Department. Am I subject to all these DOE
22 orders? Can I try to be relieved from some of the DOE orders
23 due to the fact I'm being regulated by the NRC and the only
24 DOE facility to have to be regulated by the NRC? Certainly,
25 I think in some areas we've been over conservative in some of
our approaches to management, to property control. You know,
we spent a lot of money keeping track of small amounts of
property. But, whatever, there's a bureaucratic system out
there and I support making it easier to do business.
But, do we have some specifics? I don't have a
whole bunch of specifics, but there's one. It's getting us
into a point where we can move forward with some kind of
certainty in the budgeting process.

DR. ALLEN: Warner, are you ready?

DR. NORTH: Let me pick up John Cantlon's theme, the
first one, the need for the total systems perspective. And,
I think a number of people have articulated that with various
specific examples as we've gone through the last two days.

I'd like to underscore the urgency of this and
relate it to Steve Frishman's question. I think we clearly
need better articulation of what are the goals, why are we
going underground, and what do we expect to get in what time
frame? Are we concerned about site suitability and resolving
issues such as what is the character of Ghost Dance Fault
which goes back to the first meeting I attended with the TRB
a number of years ago where we were asking that question,
looking at specific documents and responses from DOE. And,
at that time, developed some enthusiasm to the effect that we
were really only going to find out about Ghost Dance Fault by
going down there and taking a look at it. And, that judgment
didn't come from me; it came from primarily others that you can readily identify within the TRB cast of characters. But, I think we've got to distinguish, as we think about the scientific goals of the underground exploration problem, what issue are we trying to resolve in what time frame? Finding out about Ghost Dance Fault in the context of site suitability is very different from heater tests to find out about the thermal consequences of various thermal loading strategies that might apply to repository design if we decide we have a suitable site.

And, we have another decision point coming up after the license application, assuming that goes well, which is the decisions on repository closure. And, I think what we really need at this point, what I'm dissatisfied with in terms of what I've seen, is a better long range systems planning as to how all these decision issues fit together and what information we need when, in order to support the decisions on the program. We don't want to go from one near-term decision to another near-term decision. We want to recognize that some of the information, that it would seem we need, has a very, very long lead time to get it. I really think on the heater test issue, the question is not three years versus four years versus five years to have information for the license application stage; it is what do we need to know to make the thermal loading decision at the point that that's
1 really committed. And, if you go to drift emplacement in
2 such a way that you can move the containers around, that
3 commitment might come at the time that you backfill drifts
4 and work toward closing the repository.
5       So my urge, and it's primarily at you and the M&O, 6 Robby, is get on with this and do these studies even if all
7 you can do is the quick and dirty version, so that we have
8 good answers to these questions and in you're in a position
9 to iterate on the planning; not just look at the near-term
10 decision, but look at an overall strategy for going forward
11 with the program. And, within that, of course, we have the
12 problem of the lack of a long-term budget commitment and so
13 there clearly has to be some contingency. If Congress
14 decides not to provide the money for the picture Carl showed
15 us, what do you do? What makes sense to do? And, I would
16 hope that as the M&O comes up to speed, we're going to get a
17 lot more help collectively in grappling with those very
18 difficult issues.

19       MR. ROBERTSON: Let me respond a moment to that. One of
20 the difficulties that we have had with this program--and I
21 believe you've articulated it very well--we have stated as
22 much, is we tried to build a site characterization program by
23 top down/flow down of the 960.60 requirements. The truth of
24 the matter is the heuristic, scientific view of "let me dis-
25 cover everything I could ever want to know about this
mountain from the bottom up" never really converged between those two things.

Now, it appears to us and I think we've spent a lot of time--Carl and I were in a number of meetings with Bartlett and his senior staff, as well as senior M&O staff and others, attempting to articulate the basic issue of what drives this program in terms of a framework. And, I believe that we are not at a construct in which this framework can begin to articulate the elements.

There are really only four reasons for which you are collecting data on this site to evaluate it. One is suitability determination and the construct of the requirements of both 60 and 960. Secondly, the licensing requirements that are attendant with Part 60. Thirdly, the EIS requirements that are attendant associated therewith. And, lastly, the design data that is needed to ultimately design the system that is in place.

Now, if you had surrogates for each individual—who, by the way, we are on a path to build those into Carl's organization--and, you got these four people in the room and you asked them a question, what is enough data? Do you have enough data? When the answer of all four of those people is yes, then you are through with the site characterization program. You know, assuming again that that suitability determination and some of the licensing arguments are less
than precise in terms of judgment.

To follow my scenario for a moment and assume that that's a correct one, what's been missing is a lack of clearly articulated strategy for each of those elements of the program for their satisfaction of that argument. And, this point has been made by several people here that you may not decouple the licensing issue from the suitability issue because much of the suitability determination of the site in the long-term--not necessarily for the disqualifiers, but for the ultimate qualification--involves the proof that the strategy which you are intending to rest your licensing case on is supportable by the underpinning data.

Now, in the next few months, we had hoped to articulate strategies in these areas, integrate them to provide the framework against which to test this, and then establish a sequence of milestones and periodics that will be done. In parallel with that, there are a whole series of system level studies that are ongoing that are being laid out against program milestones in which they have to be made. You've heard a mention made of this business of the thermal loading. There's a classic case of where that touches virtually everything that we deal with and it's getting time critical with regard to our decision with regard to how we're going to do that. It's one thing, as I think Pat made the comment one time, it's beautiful to make an argument that we can boil
this mountain and keep the water off that cask, but do you want to rest your licensing strategy on that, a subset of which is to convince the public that boiling that mountain is okay. You know, in that sense. So, I think as a part of your licensing strategy, we have to converge on that.

And, so that framework needs to be in place for those sort of trades to occur. Granted, lots of pieces are around. They don't yet have the coherence that we can lay out for you as an analytic process that can give you that comfort factor, but I think we are converging on it. We have seen pieces, lots of pieces, and you kind of say, well, yeah, that piece sounds okay. This piece sounds okay. And, we are reaching a point within the next year that we've got to pull that fabric together where you see it as the integral. And, I think that we're making good strides with that and the team that's beginning to form here is beginning to drive more specifically at the things as they see the trades that have to be made as a part of the design process and, in particular, the ACD, the advanced conceptual designs. Bear in mind, we're dealing with a very, very outdated set of conceptual designs. So, those have be brought to test, also. So, I hope we're up to the challenge and to test it as we go.

DR. NORTH: Well, you encourage me, but I'd like to encourage you. The next three months, I think, is going to be quite critical in terms of where all this program goes
1 because there's a new management coming on board. And, it
2 would be useful to get a lot of that picture out there within
3 three months so we can all work at it.
4
5 Then, on your four point list, it seems to me the
6 over-arching consideration is something that came into your
7 phraseology toward the end and that is having to do with
8 convincing the public that it's okay. Boil the mountain or
9 the whole thing taken together. I go back to Scott Sinnock's
10 slide. Are we doing systems engineering in the narrow to try
11 to satisfy the details of those very complex requirements or
12 are we setting up something basically where we have the
13 pieces with which to convince the public that what we're
14 doing is okay? And, I think the point Scott makes, which I
15 would heartily endorse, is looking at the right hand side of
16 that diagram and considering what do we need over there, is
17 very, very important and we shouldn't let it wait until the
18 end as we're packaging the licensing application and the EIS.
19
20 We should rather be thinking about now. What is it
21 we're going to need there? What is it in terms of detail?
22 What is it in terms of a good story that can be supported all
23 the way from five minutes on morning television which some-
24 body is going to need to be able to do very articulately to
25 include all the data, and all the quality control, and all
26 the backup, that you need to survive all the challenges that
27 are undoubtedly going to be thrown at this program as you go
through the license application and the EIS process.

MR. HAYES: Maybe I'm being too sensitive, Robby, but I have to take exception to something you said, that the bottom-up approach from the scientists resulted in everything we might want to do at Yucca Mountain, simply not true. The site characterization program we now have is not the program that the Yucca Mountain Project scientists originally came up with. It has been reviewed at many stages. At each review stage, it has been added to by outside reviewers. The scientists who developed the original program did show fiscal responsibility. They did realize they couldn't do everything they wanted to do. So, I'd simply have to make that statement. They were people who care.

The other statement I want to make is these very people, it's their credibility, it's their work that's going to develop the public confidence.


MR. BALLARD: Yeah, I would just like to make a couple of little bit broader observations from a regulatory perspective.

First of all, the NRC regulations, as they are now written, do require a site characterization program. They also require the program be conducted in a manner that would limit any potential impacts on waste isolation. In keeping
with that, the regulations do note also a--they identify and perhaps even endorse the potential co-location of exploratory shafts and tunnels with repository structures in keeping with this desire to minimize impacts.

One point I would like to make and DOE is certainly very well aware of these is that the GROA conceptual design should be kept updated to be consistent then with the exploratory study facilities primarily because if there is a co-location, which seems to be an objective here, that we will be--at the license application, we will have to be sure that there's a strict regulatory or QA controls on those. I've made these points before and certainly I think that they're pretty well understood.

The other point for the Board perhaps is that NRC's role in this pre-licensing stage is strictly a review in terms of looking for deficiencies in the scope of the programs. DOE has full responsibility for the design and for a design that they can demonstrate meets the performance objectives.

And, just one other last point on the site characterization plan, I think you all know, but I just want to remind you that we have reviewed the plan. And, I think, Joe Halonish would have liked for me to say this. We have reviewed the site characterization plan. We had a couple of objections and many comments. The objections have been
resolved to date and so we are fully tracking that program and I think that the interactions we have are working well. So, I just thought the Board might want to keep in mind the regulatory context under which we're working.

DR. ALLEN: Other comments?

(No response.)

DR. ALLEN: Do you want to do your big thing?

MR. GERTZ: Sure. It follows very closely.

DR. ALLEN: I can't guarantee you'll be last, but okay.

MR. GERTZ: That will be fine. That would be no problem. It should generate some additional discussion.

I think this is an important aspect to follow right after our regulators because with all due respect, the group that you brought together, I think they did a commendable job of getting up-to-date on a very complex program in a very short time, but I've not once heard the regulatory impacts of anything they talked about. It appeared that you didn't recognize we're working in a regulatory environment with 10 CFR 60 that controls our design control, our analysis, and everything else. And, while your recommendations were absolutely on line for perhaps a normal commercial operation, we're doing something just a little bit different here. And, I need to just articulate some of those things, but in summary, most of the things I totally think were appropriate and I agreed with. But, let's just talk about some of them, as I
1 go through them.

2 If we left you the impression that we already
designed the main test level, that was wrong. We're just in
3 Title I and we're working on designing the main test level
4 and we may not even do that next year. I don't have funds in
5 the budget right now next year. It may be the year after
6 before we design the test level. Maybe, we'll do some of it
7 next year.

8 I like the idea of disputes review board. Anything
9 that could help us move forward a little quicker would be
great with a little more cooperation. So, I think that's
good. We do need to look at rail versus rubber. There's no
doubt about that. That's a very important decision to make.
10 I'm not sure about if we go the main loop all the way
11 through and then go back and do other things or stop during
12 the main loop to start, be it a drift towards the Ghost Dance
13 Fault which we all thought is important to get at or be it
14 test level. And, that's an analysis that we're going to have
15 time to do and have time to optimize.

16 But, the key thing I think I'm responsible for as
17 the project manager--and someone brought it up--is to keep
18 flexibility. To keep flexibility in the program so we can do
19 what is necessary when the time comes. Now, Steve and I, of
20 course, debate a lot and I think the question answered is, in
21 effect--the answer is, you know, why are we going under-
ground? Well, we have a set of regulations and a plan in place that's been approved by everybody that says you have to have in-situ testing and that's the purpose of the ESF. And, we articulated that well before. So, I won't go over that. But, that is the purpose of the ESF.

But, another thing, I think, that was perhaps missed in some of your analysis is when we do these things, we have to do an impact analysis on waste isolation. We have to assure that since it will be co-located, the repository design is considered in the design of the facilities we do. And, I guess I would ask your consultants if they thought in 10 years or 15 years the diameter had to be moved from 18 to 22 or 25 or 26, would they still do 18 the first time and try to go back later or would you do it 25 or 27 or what you need when you have a chance to do it this time? We would have to redesign the aspect of the program now to do a complete impact analysis of what enlarging that diameter would do to waste isolation. That takes time. Those of you that are familiar with the Calico Hills Risk Benefit or ESF alternatives know how long those kind of activities take.

While there are many good ideas and I pointed out that I think most of the things that were brought up certainly were either new to us or we had been thinking about the periphery and we are glad you were able to articulate and help us focus on some of those things, there's some other
things that I think we just have to make a programmatic
decision as a project management team and maintained flexi-
ibility and, in effect, move forward. And, one of those is
the diameter of the shaft. I mean, I could redesign it in
five months and come up with maybe 18 feet and reduce flexi-
ibility, but then we'd be a year again before we get below
ground and have we really gained anything in our ability to
understand the mountain because I think the sooner we get
underground, the sooner we'll be able to narrow our uncer-
tainty on some of the big picture items. We can get down and
look at the faults, look at the rock properties, and either
expand or narrow our test program.

It's a success on this project if we each say the
mountain is not suitable. Our sole goal is to come to an
answer and to come to that answer as soon as possible.
Sometimes, there are other things that drive the answers that
we're coming to. As I said, my only slight disappointment is
that I didn't hear the regulatory perspective from your team
as they looked at it and I think that is important because
that's what we operate in is a regulatory environment. That
involves a lot of interactions. The design that we put
forward, the large 25 foot diameter, has been on the table
for two years. We had 20 meetings with the NRC on that
design, including a design review activity. We have what I
think and my team thinks and the M&O team, including the M-K
1 people and the Fluor-Daniel, is a good solution to getting
2 underground short-time with a limited budget and finding some
3 answers.
4 I could go through some of the other stuff we've
5 learned, but I think that we've covered it all before. Let
6 me just go through quick for discussion points. As I said,
7 we did have a lot of analysis. We did comprehensive evalua-
8 tions over the years on Calico Hills and wide as possible
9 ranges of factors so we could document the design; you know,
10 licensing environment. We did have to look at these regula-
11 tory requirements. Minimize impact on waste isolation. Need
12 to consider the design criteria applicable to repository.
13 Coordinate ESF and repository designs. Need to apply QA
14 controls to all this. Right now, the ramp design, the portal
15 design will become part of the repository, subject to exten-
16 sive QA controls. And, of course, we have the safety aspects
17 and the regulatory requirements for environmental protection.
18 Where do we stand? We did have a design that
19 evolved from the Title I. We're committed to proceed in
20 phases; if not for any other reason, because of the budget
21 limitations. We now have a Title II package completed. We
22 have ramp specs done. We will be starting our ramp design
23 shortly. We have, as I said, the Title I accepted by every-
24 body. We told you about the ramp sizing study. That was
25 what the team, including the M&O team, the Raytheon team
concluded that was the appropriate diameters for the ESF.

So, in summary, we are ready to proceed. I've talked to you about those things. We've got the RFP on the street. We're ready to move right now with what I think is a good, firm, solid design. We've talked about it before. The enemy of a good solution is a potentially better one and nothing gets done. The enemy of good is better. And, as project manager, I constantly deal with those kind of decisions and some of those decisions and constraints, Larry has addressed.

We need to maintain a balanced program, surface-base and underground. Construction sequence and testing priorities, is it Topopah Springs? I think I've come to the conclusion that once through the--Topopah Springs is probably the most--is the best approach right now. A while ago, we thought maybe early access to the Calico Hills. Or do we start in ramp for long duration tests or do we start at the test level?

But, funding limitations, we've changed our approach to come to where we are. We've explained our program to you. We think it's a sound program. I've heard some concerns about larger diameters, smaller diameter, and certainly they're genuine concerns. They're concerns that we dealt with and talked with for a year or two. But, we've come to the conclusion that we need to get underground. We
I want to focus on site suitability when we get there. We want to maintain a flexible program because who knows what regulations will change and what will bring in the future and we need to demonstrate progress to insure continued Congressional support. That's not a technical line there. I mean, that's the realities of the situation. We've had senators out here. They've told me what they think the program should do. I've been in hearings and they've told me what they think the program should do. And, so I'm not trying to over-emphasize one over the other, but there's a range of reasons for doing things, some of which are technical and some of which are programmatic, some of which involve constituent support.

I think you and I collectively, the Board and the DOE team, believe getting underground soon is important. I think most people do that right now. I think we believe the tunnel boring machine is the right way to do it. I think most all the things you brought up are elements we need to study and to look at. And, we've got plans to do those, but I think it's essential right now that we move forward with the design that's on the table and modify it in the future, as necessary.

Once again, I think you all--most of you do know that because this particular ramp may be a large diameter does not mean that the hundreds miles of tunnels for waste
emplacement or additional drifts have to be large diameters. They could be whatever is appropriate. This does not tie in or force us to a large diameter for any other parts of the program. All it does is allow flexibility right now to carry out what we think is important short-term aspects of the program.

So, once again, I do commend your team because it is a complex program. I've been on it five years and I'm a quick learner and, boy, I'm still learning a lot. And, for them to come up to speed and recognize some of the shortcomings of it, some of the complexities of it in two or three days is a tremendous undertaking. So, I would really like to compliment their ability to assimilate a large amount of data in that short time.

DR. ALLEN: Carl, before you leave, could we get you to comment on Robby's thoughts on system optimization and so on?

MR. GERTZ: Yeah. I think that's one of the shortcomings of our program up to now. We've not had--I, as a project manager, I can kind of focus on studying the mountain, is it safe or not, and move myself maybe a step away from the total systems. But, on the other hand, what is right for the country? I think we need to determine what is the--do we need an MRS, will we have an MRS or not, should we be planning on that? Should we planning on some kind of on-site storage until a repository is ready? Should we have
multiple use containers that we can load at a reactor, put an overpack on it and store it, put another overpack on it and ship it, and then put an overpack on it and then place it in a drift? Should we do those kinds of things?

No, I think we'd better, as a program, get our act together and get those questions answered or else we won't have any Congressional support, at all. So, no, I support that. I work on that in only a big picture activity when John asks me to be involved.

Right now, I consider my responsibility of carrying out the site characterization program that Congress has indicated and said study Yucca Mountain. Last year, they said focus your activities, DOE, on Yucca Mountain. And, we have a plan that's been accepted by the regulator and we're trying to implement that plan.

DR. ALLEN: One question. You were very critical of the Board's suggestions for not seemingly recognizing the regulatory framework in which we all have to operate. Yet, you gave no specifics. In what way would the suggestions we made violate the regulatory framework?

MR. GERTZ: I don't know if they violated, but it was perhaps the consideration that what we have offered certainly has to be part of the repository design considerations and should we have to, let's just say, over-size the ramp, what is the extensive analysis that would go into that to assure
that making a ramp bigger would not affect waste isolation?
2 From a construction point of view, it might be easy to do,
3 but to prove that on an analysis towards waste isolation and
4 how that would affect waste isolation, the main drift which
5 is 10,000 feet across the repository block, those kind of
6 considerations, I think, Clarence, were probably not
7 addressed in any detail. Those are considerations that we've
8 gone through for two years when we went through the design of
9 the ESF and the commitment to the conceptual design of the
10 repository.
11 I didn't mean to be critical of it. I just said
12 that that was an area I didn't hear covered.
13 DR. CORDING: No, and I believe that it is not--
14 enlarging the ramp would--enlarging the drift size would not
15 prove to be a problem to do it in terms of the repository.
16 If you change the size of the ramp, you can do it with equip-
17 ment and means that would not disturb it any more than any
18 initial construction would or to any significant extent.
19 I understand the point that you have to go through
20 the process and get this approved. I don't think that we
21 feel in any way that it--I haven't felt in any way that going
22 through and enlarging the drifts even relates very strongly
23 to site suitability or to the repository requirements except
24 that you do have to go--we recognize you do have to go
25 through these processes. And, one of the points we made, as
we started some of our discussions and as we've continued, is
that we feel our priority is to continue the progress. We
recognize that in engineering, as you go further down the
line, you become more limited in the decisions you can make
and that you have to set what you've already developed and
you proceed with that. And so, you may not have the best
solution at the time you're looking for adequate solutions as
you go further. In earlier stages of design, you have more
flexibility.

You're getting very close to trying to go under-
ground and so we recognize--and, in fact, some of the com-
ments that have been made by the consultants is recognizing
that your options are becoming limited. I think one point,
however, is that when we looked at the ESPAS about December
or November of 1990, we at that time commented on our concern
for the size of the opening. And so, we have very consis-
tently in the past years been asking about that and I don't
think we've ever had resolution. I think it's partly because
there wasn't a lot of development in a certain portion of
that period. Funding and continued development of some of
these issues or design because of funding problems and that,
as you came to this last--this FY-93 budget, you said we are
going to go underground and that was partly at our urging or
recommendation. So, you're in a process where things have
gotten somewhat compressed and we recognize that.
I think one other point, though, that I would like to make is that the design that has been coming through has been 25 feet. And, now, we are hearing 27-1/2 feet and even up to 31 feet. And, that the 31 foot could be an option based on what machine is available. Now, to me, that is starting to get into issues that are different than what your baseline configuration was. And, so I think that's an area that I would have a continuing concern on.

MR. GERTZ: And, I would, too, if it increases program costs because I think you made a very salient point. What good does it do to save $1 million or $2 million on a machine if you spend $15 million more on excavation or operations.

DR. CORDING: True.

MR. GERTZ: So, that has to be evaluated as part of the process.

DR. CORDING: And, other impacts in regard to suitability with regard to changing the size from 25 to 31. You went through the process basically for 25 feet. So, is there something else involved? If you go to a larger size, does that have suitability--

MR. GERTZ: How much more analysis do I have to do for that.

DR. CORDING: To go even larger. So, I think this cuts both ways.

MR. GERTZ: I think you're absolutely--
DR. CORDING: One other point is that it does--I know there are backfilling approaches and all and, as you go through this repository and you go through it at what you intend to have as a repository level, is there a potential that you may have to change the level of the repository? And, if that occurs and you have a drift through there and--your exploratory drift in that area, is there an approach to handling that and changing the level if you have to? In other words, although with the best efforts you've tried to stay right in the area of the future repository, you have moved it and you no longer have the drift in the place you would like to have it.

MR. GERTZ: Certainly, we're looking at sealing approaches right now which is--further on, after 50 years, we would have to seal it and we have some conceptual designs about sealing those kind of things. And, should we happen to change repository design, we'd have to assure the NRC our sealing approach would not affect waste isolation, would not create preferential pathways, and we'd have to go through that analysis. And, I guess, my frustration with the system is those analysis take time and money, and while you're doing that, nothing else gets done for some things.

So, when we were talking about the ability of waste isolation, it can be done, but even simple things like a sewage pond, we can't put a sewage pond out there right now
without an analysis that it won't affect waste isolation by
infiltration or anything like that. Not a difficult analysis
to do, but something that has to be done in a QA program,
approved, and accepted. That's our commitment to insure
anything we do does not affect waste isolation. And, the
program I guess I still lean on right now as the project
manager is let's make it as flexible as we can early-on and
let's get started. We've been just kind of laying back too
long. Congress has said let's get started and we're ready to
get started.

DR. ALLEN: Okay. Thanks, Carl.

Let me finally ask here as we approach the end if
any members of the Board would like to make any final state-
ments? Don or Garry or Pat or anyone else?

DR. CANTLON: I would just make a closing statement
which I hope will be the end of the whole--

DR. ALLEN: Okay. Let me thank you all, but I'll let
John Cantlon make the final statement.

DR. CANTLON: Well, on behalf of the Board, let me thank
all of the participants that are here. I think this has been
a very fruitful exchange. It's certainly helped the Board in
contending with what are some very, very difficult issues and
we're hopeful that our report will be arriving on the scene
at a very propitious time and I think you've given us a lot
of insight that will make sure that what we recommend is
doable, reasonable, contributes to the resolution of the
problems.

So, thank you all for attending. It's been useful.

(Whereupon, at 3:45 p.m., the meeting was adjourned.)