GEORGE WILLARD FRANK,
Senior vice-president,
Austral Oil Company, Incorporated

DIRECT EXAMINATION BY MR. YANNACONE:

Q. Mr. Frank, do you want to give u your full name and address for the record, please?

A. George Willard Frank. My home address is … Houston, Texas.

Q. What is your present occupation, Mr., Frank?

A. I'm senior vice-president of Austral Oil Company, Incorporated.

Q, ·How long have you been so employed?

A. Thirteen and a half years.

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Q. After a gas field is located, before any production activities are commenced, what if any investigation or valuation is wone of the reserve?

A. Well, from the inception we normally, or most companies normally attempt to determine the extent of the field from the initial productive well. This is not always possible to do with accuracy. But as development proceeds? he accuracy of your prediction for ultimate recovery from a particular field increase.

Q. What are the criteria that determine whether a test well will be dug at all?

A. I presume you mean the initial well on any prospect

Q. That's right.

A. Well, probably the most important single thing to know that you have a suitable geologic structure on which to drill.

Q. And does this require any drilling activities or is this done with conventional geophysical exploration methods?

A. Well, the prospect is usually developed through geophysical and geological prospect work, and then in order to determine whether or not you were accurate in the assumption that you have made and the criteria that you have used for drilling, you must drill in order to determine whether or not the gas or oil is there.

Q. Now, are you, in the regular course of your profession or activities as senior vice-president of the Austral Oil Company involved in the exploration and potential development of the Mesa Verde formation in Colorado and its environs?

A. If I understand your statement, the exploration portion is not my particular field. That's the geologic portion Now, if

we're talking about something else, why, perhaps I don't understand the question.

Q. In other words, who or what group discovered that there was natural gas in the Mesa Verde formation to justify your investment in potential production?

A. Of course, I believe the presence of the gad in the Mesa Verde has been known since the middle '50's. There were several wells drilled during the late '50‘s and early '60's by others.

Q. And did these produce natural gas?

A. Yes.

Q. Now, at what point did your company, the Austral Oil Company, become involved in the Mesa Verde formation if you know?

A. In 1965.

Q. And how did that involvement start? In other words what form. did it take?

A. Well, specifically, after our company had recognized the impending gas shortage, we set out to find an area in which we might develop through the use of nuclear explosives a gas productive field. And with this in mind, we found a Bureau of Mines report which indicated that the Piceance Basin was an extremely suitable area for the use of experiential work in the use of nuclear explosives.

Q. Now, Mr. Frank, you mentioned the

shortage. What shortage are you referring to?

A. The national impending reserves to production ratio that the Federal Power Commission and the Department of Interior have on which they presented several talks and papers last year.

Q. In the course of your regular professional activities as senior vice-president of the Austral Oil Company, have you had occasion to acquaint yourself with these ratios and data on which they are determined?

A. Generally.

Q. And now would you, for the. record, please describe for us just what this ratio is and how it's figured?

A. Yes. The method by which they determine — the Department of Interior determines the production reserve ratio is the use of gas on an annual basis versus the discovery rate and incorporated with that is the known reserves of the country at a given time.

Q. And do you know the basis or source of the use figures?

A. I guess I would have to say no to that, except that the —

Q. Do you think. they are furnished the., ...

A. The Department of Interior has published those figures, and where they

obtained all of them, I'm not certain.

Q. And this is based on current actual use from measured sources, such as the Federal Power Commission Reports would have?

A. Yes.

Q. Now, the next element of that is reserves, I think. How are these reserves figured then?

A I think it varies. I believe that we could say reasonably that they are computed by competent engineering firms. Many oil companies use reservoir engineering firms to calculate their reserves. Those are in turn sent in to the pipeline. company's projection for the contracts with the companies, and in turn are combined, I suppose, by the Federal Power Commission and for the Department of Interior. I'm not certain about that.

Q. And the reserve figures that are involved deal with known reservoirs of gas or oil, right?

A. Yes.

Q. Now, who furnishes the data originally on the known reservoirs? Do the oil companies themselves identify them?

A. Yes basic data.

Q. And do the oil companies themselves permit independent third parties to measure the reservoir or reserve potential of their developed fields?

A. Yes.

Q. And do you make independent checks of them yourself

A. Yes, sir.

Q. At the present time have you made such investigation with respect to the natural gas reserves potential of the Mesa Verde formation under the development through Project Rulison

A. I may need to preface what you said.

Q. Sure.

A. We have calculated the amount of gas in place. We don't know what the exact recoverable reserve is because of the phenomenology involved with the nuclear explosive. That's part of the test.

Q. In other words, then these reserve figures that are used in determining the ratio of use t9 reserves depends to some extent on the development potential of the reserve?

A. Yes. This reserve that we are speaking of here is the proved recoverable reserve and not those that are net economically recoverable.

Q. What are the elements that go into the determination of the proved recoverable portion of the reserves as opposed to the total amount of fuel there?

A. The Federal Power Commission has set up specific rule with respect to the proved

recoverable reserve figure that can be used by a pipeline company when a request is made for construction of pipelines, the justification for a contract which could in general, I would say, be at an anticipated life of 20 years.

Q, In other words, then you're looking for reserves that have a potential useful life of at least 20·yeari before you call them proved recoverable reserves?

A. Yes.

Q, Now, this is a question I asked Mr. Frank in conver3ation beforehand, and we might as well put the answer on the record completely. What is the usual economic output or the output considered economical from the average gas or oi field? Let's take a gas field.

A. Well, it's a relative matter. It's a matter of return on investment. Of course, a well that would cost as much Ls a million and a half dollars could in fact be very economical, whereas a well costing $20,000 or $25,000 might be uneconomical. It's totally a matter of recoverable reserves versus cost of recovery.

Q. Well, again, with respect to determining that proven reserve figure for determining the ratio of use to proven reserves, we have to deal with the term you have mentioned,

completely recoverable reserves, right?

A. Yes.

Q, Now, what are the criteria, the elements, of making that determination? How do you determine whether a given set of wells, whether the gas thereunder, are economically recoverable?

A. The usual procedure, whatever well it be, gas or oil, is to determine appropriate test procedure by which you can find out both the productive rate at which a well can produce, as well as its reserve associated with the well.

Q. Now, productive rate, are we talking about the unit volume of gas per unit time?

A. Yes.

Q, And what is the range wherein a well is considered productive? In other words, how much gas do you have to get out of a well to consider it productive?

A. To consider it economically productive?

Q. Yes.

A. This again varies by the companies associated with the project, because it's a return on investment. And the company might be satisfied with a given return on investment and another company, because of their particular situation, nay be satisfied with a smaller return or larger return on their investment.

Q. What are the elements that go into the cost of bringing the gas up?

A. Well, of course, the drilling cost is usually the most substantial cost.

Q. And is this solely a function of depth?

A. No. It's time and pressure involved, not necessarily the depth.

Q. But once the initial well is drilled, a determination can be made of the actual cost of that well?

A. Oh, yes.

Q. Are there any other costs other than the direct drilling expenses that go into determining the cost of producing from that well?

A. Well, yes, the overall picture of course has to include the cost of the leases, of the economics that are associated with those other costs that are a part of the total development of the field.

Q. Now, is the principal element of cost the cost of the leasehold and the cost of the drilling or are there other major. elements?

A. Well, if we include in the drilling the cost of all the equipment associated with it —

Q. Yes, capital equipment.

A. — those are the two predominant elements.

Q. Now, are these costs substantially different

throughout the country, field by field?

A. They certainly are. There is no rule-of-thumb to cost.

Q. Is there any way of determining in advance from the geophysical knowledge of the field approximately what the cos1 of development would be?

A. You an approximate it. Yes, there is a reasonable chance that you can make a close estimate cost.

Q. Now, when you determine the cost effectiveness, as it were, of the operation in a particular field, you weigh th4 total costs you have described, which include the engineering cost, the drilling cost and the leasehold cost as principal elements against the amount of natural gas you can produce in the well, is that correct?

A Correct.

Q,Now, how is the natural gas produced valued? n other words, what is the unit of value for the natural gas that comes out? How is it sold or marketed at the wellhead

A It's a price per thousand cubic feet.

Q, Thousand cubic feet?

A Mcf.

Q. You use M for thousand? Okay. Is that price different in any substantial amount than the price up to the consumer at the end of the pipeline?

A. It's substantially different.

Q. Just to keep the record straight, is the consumer price higher or lower than the wellhead price?

A. The consumer price is considerably higher.

Q. Now, is there a uniform wellhead price or an approximate range of price around the country at any given time?

A. Across the country?

Q. Yes.

A. No.

Q. In other words, the gas from each different field sells for a different price at the wellhead?

A. Not necessarily each different field, but in given areas.

Q. Are there major areas in which prices tend to remain constant within the area?

A. Yes. The Federal Power Commission has designated prices on interstate markets for given areas,

Q. In other words, then the federal government has determined the market are•:and fixed the price at the wellhead for the supply sources within that area, right?

A. Yes.

Q. Are these prices substantially different region by region, or do they run at the same

range?

A. There is a substantial difference in certain areas between the highest and the lowest range.

Q. Is the price determined or dependent in any way upon the cost of producing the material, gas, or is it just fixed arbitrarily?

A. I believe that the Federal Power Commission thinks they have fixed the price on the cost of acquiring it and producing it.

Q. Do you, Austral Oil Company, furnish the Federal Power Commission with data on which to arrive at a fair price based on cost?

A. Yes, sir.

Q. Is the price at a given well head fixed before or after the total cost of producing that gas unknown to the company?

A. I would like to qualify my answer just a little bit in that the price on the interstate market is fixed without regard to cost of a specific well or the specific development o the field.

Q. Then, in other words, you have to bring your well in within this hypothetical average cost that the Federal Power Commission has used to determine its regional rate structure in order to make it profitable, right?

A This is the basis on which you develop, yes.

Q, Now, is this hypothetical cost figure that the Federal Power Commission uses based on actual cost of producing wells already in existence or is it some computed number that they take from nonpractical data, as it were?

A I'm sorry. I'm not able to answer that.

Q, Do the costs of each new well you produce or bring to production go into the consideration of the next rate determination for that area?

A No, sir. May I correct that?

Q, Sure.

A. In some cases I presume it's true, but I'm not certain that it ever does.

Q. In other words, then you people are pretty much at the mercy of an arbitrarily determined price at the wellhead that is independent of the cost of producing from that particular well?

A. That is correct.

Q. Now, does this then make it necessary for you to produce at the hypothetical cost per unit output or abandon the well?

A. On a well-by-well basis, that's not a fair analogy. I mean it's entirely possible that you could have several wells in the field, one or two of which would be not economical to produce by themselves but would in conjunction with other wells?

Q. Then, in other words, you can mix within a

given area

A. Within a field.

Q. Now, again, for those of us who are not familiar we the industry as such, when you refer to a field, is this a definable geographic region?

A. Or a geologic region is usually developed, and then you can say, yes, there is a geographical region that these covers.

Q. Now, do you treat this single geologic region that produces through a number of wells as a Single region for your own corporate purposes?

A. Yes.

Q. Or do you treat each well on an individual basis?

A. No, I'm not sure what the question is exactly. I presume that you have reference to our accounting procedures.

Q. Well, both accounting, and more important than that development purposes. Do you treat the field as an entity?

A. Yes.

Q. And does it make a practical difference within a given field where you put a particular well?

A. Yes.

Q. What are the criteria that determine optimum well location for a given field?

A. Of course, our objective is the same as that of all oil and gas commissions across the country, in that we have the most optimum spacing in order to recover the optimum and maximum amount of gas, condensate or oil with the least number of wells in order to make it economic.

Q. What are the criteria that determine optimum spacing?

A. The reservoir conditions, the porosities, permeabilities, whether you're talking about gas, oil and so on.

Q. In other words, there are physical geological parameters that determine optimum spacing of wells?

A. Yes.

Q. And these can be measured and determined by your geophysicist with the help of a few · test- ·wells?

A. Yes.

Q. Now, is Austral Oil involved in the development of the entire Mesa Verde field?

A. I don't know what the entire Mesa Verde field is.

Q. Does anybody know at this time how image the gas field in the Mesa Verde formation, in which Project Rulison was located, how large it extends?

A. The Mesa Verde covers all the Rocky Mountain area. My answer would have to

be, no, it doesn't.

Q. Does it appear from data that has already been developed that the gas productive potential of the formation, which is interstate, almost the whole range, will vary from area to area?

A. Would you restate that, please?

Q. Yes. Does it appear to the engineers in your company and yourself that the gas production potential of the formation will vary throughout the entire formation and that some areas will be more productive than others?

A. Yes.

Q. Now, are there physical and geophysical parameters that determine the difference in productivity?

A. Yes.

Q. What are the basic geological differences that will determine which area is more productive than which?

A. Porosity and permeability, water saturation and gas in place.

Q. Now, is the gas in place a function of the permeability, the porosity, the underground water, and the like, or are there some other elements that determine how much gas is in place?

A. Structure.

Q. Now, is the structure of the Mesa Verde

formation, from a gas-bearing point of view, constant throughout the formation?

A. I'm not sure I follow your question.

Q,, Is the entire formation which spreads throughout the whole Rocky Mountain area, is the gas-bearing potential of all of it the same?

A No.

Q, What are the geological factors that determine how much gas in place you will find in a given particular area?

A It's very similar to the question I answered. It's the porosity, permeability, structure, water saturation, and, of course, the sand itself.

Q, In other words, the same geophysical parameters that affect production capability affect the amount of gas in place

A. Yes, to a certain extent.

Q, Now, in other words, then, if an area is of similar gas amounts of gas in place, you should expect similar geophysical characteristics, right?

MR. EARDLEY: Restate the question.

A Yes.

Q. (By Mr. Yannacone) For areas within the Mesa Verde formation, which is a very large area, that have similar amounts of gas in place per unit area, you would expect then similar geophysical parameters, porosity,

permeability, under• ground water and sand?

A. Not necessarily.

Q. Then what is the basic criteria, environmental criteria, that will make a difference between the amount of gas in place and the production parameters, as it were?

MR. SEARLS: He has already answered that question.

MR. YANNACONE: He said they were both the same,

and then he said they were different.

THE DEPONENT: Read my answer.

(Record read.)

MR. SEARLS: For clarification purposes, do I under• stand that you're asking the question that if you have different fields with equal amounts of gas reserves, that you would expect to find the same permeability, the same porosity and the same structure?

MR. YANNACONE: Within the Mesa Verde formation, yes.

A. I can't say that I am knowledgeable enough about all the Mesa Verde area to answer you with a yes or no. But the things upon which your judgment is based are geological and not geophysical. The geological example could b that you could

have a thinner sand section with higher porosity and have the same amount of gas in place.

Q. BY MR. YANNACONE: In other words, then all the parameters are interdependent and you can't pick one of them off as being independent?

A. That's right.

Q. Now, what information is necessary from Project Rulison to you at the Austral Oil Company in order for the company to make a determination of the actual estimated cost of recovery per unit volume of gas?

A. We must know how much gas can be produced in a given time period from a nuclear stimulated well.

Q. What is it about the Rulison test that will give you this data?

A. At this point, we have no data.

Q. Well, assuming you get it, you plan to get it from the test that has just been fired, right?

A. Yes.

Q. Now, what is it about the test, in other words, what measurements will you take, what data will you acquire that will enable you to make this determination?

A. Through various test procedures, both high-rate testing and low-rate, long-term testing.

Q. Do you want to back up and tell us what

you mean by high-rate testing?

A. Yes. We have in our plan for testing some initial high-rate production tests that, at least in our planning stage, we hope that we can produce the reentry well at a rate of approximately 20 million cubic feet a day for short-term with intermediate shut-in periods so that we can determine the gas volume of the reservoir — excuse me — of the gas volume of the chimney. After that we will run some isochronal tests — really, they are time tests — of lower rates, probably in the order of five million cubic feet a day to determine what can be found out or what knowledge can be gained from the fractures that occurred from the nuclear explosion. It may be that when the test period starts, we will vary the production rates and that the 20 million high rate we had projected could be more or less. And the same thing could happen to the isochronal test period.

The third step that we hope to use in our test procedure would be a longer term, probably six months, of a low3r rate in the order of two million a day to five million a day, depending on how the well reacts during that time period. from that we should be able to tell something of the affected area of drainage.

Q. Now, what is it that will tell you about the

affected area of drainage of those tests?

A. Would you restate that, please?

Q. You have described this series of tests in which you will derive a conclusion as to the amount of drainage area in the field perfected by the stimulation process, eight?

A. Yes.

Q. What is it in those tests, what element of those casts will enable you to make that determination?

A. When I explained the first test, I mentioned that we hoped from the high rate to determine the chimney volume.

Q. Do you want to tell us how you are going to tell the chimney volume by using the high-rate output for a period of time?

A. No.

Q. The second question is like unto the first, why not?

A. I'm not certain that I can adequately explain it. We have a great number of reservoir engineers involved in this whose determination has been that we can; through high-rate testing and development, have this information.

Q. Do they work for Austral Oil?

A. Some work for Austral Oil.

Q. And some of them are independent?

A. Yes.

Q. What independent companies are involved?

A. CER Geonuclear Corporation.

Q. Has CER Geonuclear Corporation furnished you with a report as to just how it intends to determine the volume of the chimney from the high-rate testing?

A. Yes, but I am not familiar with the report.

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Q. Now, do you ever expect to determine the relative proven reserve capability of the field under stimulation?

A. I would hope that we would be able to draw some conclusion from this test well as to the reserve for a given area for which additional data could be projected.

Q. For what area do you expect to draw this conclusion from this test?

A. Well, initially this immediate vicinity around the reentry well.

Q. How big an immediate vicinity?

A. One of the portions of our test, the Rulison test, it is to determine what area of drainage might be a reasonable area to expect to drain.

Q. What elements of the -test will enable you to determine this area of drainage?

A. The rate of pressure drawdown versus productive rate.

Q. What do you mean by "pressure drawdown," so we can keep the record complete?

A. We would expect, through high-rate production and long-term production, to reduce the flowing wellhead pressure because of the permeability of the reservoir.

Q, In other words, then the amount of pressure reduction will enable you to determine, by using some kind of standard mathematical method or engineering method, the permeability of the reservoir?

A. Right, the relative permeability, yes.

Q. Relative to what?

A. Relative to the existing natural permeability in the fractures.

Q. Now, just how do you expect to get from that to the area of the reservoir?

A. It's a matter of economic drainage.

Q. What do you mean?

A. Dependent upon the cost.

Q. What do you mean by that?

A. Dependent upon the cost of the well, of an anticipated well cost, versus the amounts of gas recoverable in a given length of time.

Q. Now, to the best of your knowledge, what will the cost of the drilling operation and the recovery operation run in Project Rulison on the one-well basis, just an order of magnitude?

A. You mean on this particular well?

Q. Yes, on this well.

A. On the one well we have just drilled?

Q. Right.

A. I believe you will have to describe which one we're talking about, because, as you know, we had several involved in the project, the emplacement hole, the instrument hole and the two original test wells.

Q. Now, let's find out whether these are all potentially useful. You have an emplacement hole at the lower portion of which you detonated a fission bomb for the purpose of stimulating production. of gas or actually the release of trapped gas in a given geological formation, right?

A. Yes.

Q. Surrounding this other well had been dug an instrumentation well —

A. Yes.

Q. — and two test wells?

A. Two test wells were some distance away.

Q. Are all of them capable of producing natural gas?

A. The two test wells we originally drilled are capable. The other two are still plugged.

Q. Now, are t ese capped now, these two test wells?

A. No. They are producing.

Q. Are they producing natural gas?

A. Yes.

Q. How far are they from the emplacement well?

A. Roughly five miles.

Q. And are they in the same geological formation as the stimulation shot was supposed to affect?

A. They're in the same general geologic confines of the Mesa Verde, which is interbedded sand and shale.

Q. Are they producing now?

A. Yes.

Q. And are they producing economically?

A. No.

Q. Has there been any change in their production since the blast?

A. Absolutely none.

Q. These are Austral gas wells, right?

A. Yes.

Q. You can conclude on behalf of Austral Oil then that the stimulation shot didn't stimulate these two wells to any more production, can't you?

A. Yes.

Q. Now, how far is the instrumentation well from the implantation well?

A. The surface location of the well is 285 feet southeast of the emplacement well.

Q. And at the level of the stimulation shot, are they roughly the same distance apart?

A. Roughly the same, yes.

Q. No slant drilling involved?

A. No.

Q. What is in the instrumentation well now?

A. This is a misnomer. We are calling it REX, as it was an exploratory well hole, and there is no instrumentation in it.

Q. Does is it enter the same general formation I which stimulation was thought to be accomplished?

A. It did at the time it was drilled. It has since been temporarily abandoned or plugged back with cement.

Q. That's the same kind of plugging you have got in the implantation hole or different?

A. No, it's different.

Q. What's the difference?

A. This is cement.

Q. You mean like ordinary buildings out of cement or in highways?

A. Yes, that's what you call concrete, with sand and gravel in it. The difference is the cement is a — pure material or

relatively pure, and dependent upon what weight cement or what density of cement you want.

Q. It's just made with water and no sand?

A. That's right.

Q. In other words, then it's relatively easily drillable?

A. Well, with proper techniques, yes.

Q. Now, what are the differences between that well, physically, other than the fact that it's plugged with cement, and the Rulison shot well

A. By that you mean the method in which we drilled it or the way it's cased?

Q. No. Just physically with respect only to potential production output.

A. At the present time the emplacement hole, we think, is still filled with sand and bentonite and gravel plugs which started at the device emplacement point and came to within 200 feet of the surface. These are alternating layers. The REX well has seven and five-eighths inch casings set to 6,367 feet and below that is a five and one-half inch liner cemented in place through the same section of the Mesa Verde. Th re are bridge plugs left down in the hole in the five and one-half inch. At the bottom of that a cement plug was set, a 1,500-feet

cement plug up to a depth of approximately 5,500 feet. Above that is water to a depth of 1,500 feet.

Q. Was that actual water or water —

A. — water injected into the hole and a bridge plug set there. And above that is a 1,300-foot cement plug, or 1,200-foot cement plug — excuse me — and from 300 feet to the surface is water, and the well has a Christmas tree on the surface.

MR. EARDLEY: You haven't told us how deep the well is.

A. I perhaps am wrong about the exact depth, but I believe it was 8701 feet.

Q. (By Mr. Yannacone) That's roughly the same, a little bit deeper than the Rulison well?

A. May I refer to my earlier affidavit about the depth

MR. YANNACONE: Yes.

A. My memory is not too good on numbers. I did not recite the depth here.

Q. (By Mr. Yannacone) That's close enough. It's in the same range, roughly?

A. Yes.

Q. And it's in the same formation, right?

A. Yes.

Q. Now, without any consideration of radiation, safety or the like, if both wells

were to be immediately converted to production at whatever maximum possible production capabilities they had in them, what would the difference be, if any, between the production development of the REX well and the emplacement well?

A. Could I get you to restate that? I am not certain I understand it.

Q. Yes. Assuming that you wanted to develop both the REX well and the production well simultaneously and that there as no need to consider radiation or anything else, you were just going to use the best and quickest and optimum gas well techniques, what would the differences, physical engineering difference, be in the development of the two wells, if any?

MR. SEARLS: You base that upon the information they have without any further information?

MR. YANNACONE: Yes, just with respect to getting down to the formation.

A. You stated for the development of the two wells?

Q. Yes.

A. Do you mean reentry for the purpose of placing them on production?

Q. Yes.

A. Well, first, I'll take the reentry of the REX well. The procedure for reentry is rather simple in this case because the well

has been abandoned in such a manner that there, is no pressure at the wellhead.

Q. What does that mean?

A. There have been cement plugs set down in the casing in the seven and five-eighths casing and in the five and one-half inch casing. Consequently, there is no pressure at the surface. It's zero. You can remove the Christmas tree, and the well is dormant. By comparison, the RE well which is the emplacement hole, has 12,480 pounds pressure at the surface.

Q. Stop just a moment. What kind of pressure did the RE well have before the blast?

A. At the surface?

Q. Yes.

A. None.

Q. Did the pressure at the surface build slowly or quickly?

A. Slowly.

Q. Since the blast?

A. Yes

Q. Do you have any idea what causes that pressure?

A. Yes.

Q. Tell us.

A. Well, we certainly hope it's been the stimulation of gas.

Q. Again, for those of us who are not familiar

with the field, we have all seen oil gushers or pictures of oil gushers. What is the gas equivalent? What would happen if you just opened the top?

A. We don't know at this time, because of the restraints that have been put on us, what is in the ten and three-quarter-inch casing.

Q. Well, if this were natural gas from a normal natural gas developed well and it had this kind of head on it, at a pressure, and that it was just released suddenly what would happen?

A. In the Mesa Verde formation, without stimulation — do you want to qualify it some more?

MR. EARDLEY: I think he means if you just take away the Christmas tree.

Q. (By Mr. Yannacone) In other words, what is the gas equivalent of an oil gusher!

A. Well, in this particular case, probably very little would happen. We would expect that the pressure would bleed off rapidly because of the stemming material between the depth of 8,000 feet and 250 feet at the surface, the relative permeability of the stemming material, how fast the gas can move through it.

Q. This pressure then has been built up by gas

that has just leaked through the stemming material?

A. It could be one of them, either that or one of two other things; either around the cable or through the cable, because all of the cable was cut off and placed back inside of it and capped at the wellhead.

Q. Now, is there any way you will be able to find out which of the three causes produced the pressure?

A. At the time of reentry, yes.

Q. How will you find out?

A. We can arrange to take some flow tests from the well It should be easy to find out the rate of flow from that well,

Q. And how will this tell you which of the three methods was the cause?

A. We won't know exactly, but it will be a relative matter. If we are able to obtain high-flow rates, we can feel certain that at least a major portion of the stemming material is no longer in place.

MR. SEARLS: I think we can shorten your questioning by saying that we do not intend to produce through the emplacement well. We do not plan the reentry through the emplacement well. They have changed their opinion about this and their conclusion since the Preliminary Injunction hearing.

MR. EARDLEY: He might ask how they planned the reentry. That will save you other questions.

MR. YANNACONE: If you had told me that ten minutes ago, we wouldn't have had to do this.

THE DEPONENT: Could I ask for a recess and talk

MR. YANNACONE: Why don't we take 15 minutes ***

Q. (By Mr. Yannacone) Mr. Frank, this stemming material is in the exploratory hole, the REX?

A. Wait. Our stemming material is in the RE well, the emplacement well.

Q. And cement is in the REX hole?

A. Yes.

Q. Now, would you like to comment on Mr. Eardley's statement that the exploratory well will be used for reentering the cavity?

A. Yes, this, of course, is based on the assumption that when we sample the gas and attempt to flow gas from the emplacement hole that we will find that the stemming material is still in place. If in fact we can determine that the stemming material is not in place, this would eliminate the necessity of reentry of the REX hole, because it would then have productive capability out of the well

in which the device has been emplaced.

MR. EARDLEY: In other words, the stemming material might have dropped right down into the chimney, and you have just got a well right then and there.

Q. (By Mr. Yannacone) In other words, then the sole criteria for determining which hole you're going to go back into the underground cavity that you have caused by the atomic blast is which one is cheaper to reenter?

A. No. I think one of the things you must consider is that although we don't now think the stemming material-or we think that the stemming material is still in place, we could in fact find that, through some phenomena, we could have filtration of gas, making the stemming material more fluid, and the stemming material could have fallen back in the chimney.

Q. Just so we can clarify the record, is it cheaper to reenter through the REX well or the RE well?

A. It may be slightly less expensive to enter through the REX well, simply because normal oil field drilling procedures can be used in the REX well from the surface down now?

Q. How do you intend to enter the cavity at

first to very close to the chimney, because of no pressure.

A. Our present plan, because of our present knowledge, is to reenter through the REX hole.

Q. Was this your plan back in September?

A. Back in September we were considering reentering the RE well, at which time this was prior to the shot, you'll recall, at which time the device had not been fired and we were uncertain at that time whether to expect some pressure, no pressure, or substantial pressure at the wellhead of the RE well.

Q. What is it that happened between September and now that has led you to make the decision to reenter through the REX hole?

A. The safety concern of reentering, when we start at the surface of the RE hole. As you can see, we would initially be required to be pressure-tested then and commence our work under 2,480 pounds surface pressure, if in fact this couldn't be bled off rapidly. And since we do not know at this time whether it could be bled off rapidly down to zero and only a small amount of gas to contend with during the reentry, it seemed more prudent and safe to enter the REX hole. It eliminates also the necessity of disposing of sand and gravel which might be contaminated.

Q. When you get into the cavity of the REX hole, what do you intend to do?

A. Would you be more specific?

Q. Are you going to run a well into the cavity through the REX hole?

A. Yes.

Q, Now, I assume that since it's 250 feet away, somewhere down the line you're going to have to slant the drill, right?

A. Yes.

Q. Is there going to be any attempt made to pump or recover from the existing REX well without any slanting?

A. No.

Q. In other words, then you must enter the actual cavity where the nuclear device went off?

A. We hope to, yes.

Q. Now, when you enter that cavity, you expect to find natural gas, right?

A. Yes.

Q. What are you going to do with that natural gas when you find it? Are you going to have the same Christmas tree assembly on top of the well?

A. The same as now exists?

Q. Right.

A No. At the time of reentry we will have what is known as a preventer stack,

which consists of several different pieces of safety equipment.

Q. And what will their job be?

A. To allow us to adequately control the flow of fluids, either by choice or if we were to obtain pressure enough to require closing the preventers around the drill pipe so we could control the flow of gas and/or mud or gas-contaminated mud.

Q. What are you going to do with the gas that comes to the head of the well through this REX well when you reach the cavity?

A. We keep it fully contained until we have all of the equipment on there necessary for testing.

Q. What kind of tests do you intend to make?

A I believe I answered that.

Q, The same list of tests you're going to make from the other hole?

A I think we need to clarify whether we're talking about, in testing, about after the completion of the well, after the drilling of the operation.

Q, At what point are you going to find out what the chemical and radiological composition of the material in the hole is?

A We should find some information or some data with respect to that when we have entered the cavity with the drilling

bit.

Q. Are you going to make any attempt to measure the drilling bit. chemical and radiological and physical characteristics of the material that has caused the pressure to develop in the RE well?

A. Yes.

Q. Do you plan to do that before you start a reentry through the REX well?

A. Yes.

Q. What chemical and physical tests do you intend to perform?

A. I believe that that should be answered by one of the other witnesses.

Q. At the present time you say you have two wells within five miles that are producing some amounts of gas, is that correct?

A. Yes.

Q. Now, how much gas are they producing?

A. Minor amounts on the order of 50 to 100,000 cubic feet per day.

Q. And how much gas would be necessary in those wells to be produced on a daily basis to make them economical?

A. I can't remember what the cost of the wells is. Probably on the order of one to two million cubic feet a day.

Q. Now, how much gas will be necessary to be produced from the Rulison well in order to

make it economical, just an order of magnitude?

A We don't anticipate that we could produce enough gas to make this particular well economical.

Q, Is there any procedure under consideration now by Austral Oil to convert the technological information developed at this Rulison Project into economically producing wells?

A. You mean do we have a plan for another well?

Q. No. Have you made any determination of what will be necessary to determine whether nuclear stimulated wells can be economical?

A. This is a difficult question, because there are many unknown things at this time in the research and development area concerning the cost of nuclear devices, the eventual commercialization of nuclear explosives so we can tell what maximum cost could be involved in a given nuclear project, whether it be in this area or others, in order to eco nomically produce gas.

Q. In other words, then this Project Rulison is purely an experiment?

A. Yes.

Q. And it's an experiment to see whether or not a sufficient quantity of gas can be stimulated by a nuclear blast underground

to justify continuing this type of development of tightly held gas reserves in the field, right?

A. That's one of the objectives.

Q. What are the other objectives?

A. Of course, the quantity is important, but the rate of flow is also important. This is an early stage of development. So we must know eventually from this and Gasbuggy and others whether or not gas can be produced such as could be marketable.

Q. What do you mean by "marketable"?

A. Such as the contaminants are in an acceptable range if any.

Q. When you say "any," if any contaminants?

A. Yes.

Q. Do you have any belief or any reasonable scientific, engineering or commercial expectation that there will not be radionuclide contamination of that gas?

A. Of all gas in the reservoir?

Q, Do you have any scientific basis for that in the way of published documents, literature, reports, or otherwise?

A. No.

Q. Now, the gas that will actually be produced from this test well is of no commercial importance, is that correct?

A. That's correct.

Q. And you're solely interested in its flow rate and its quantity, right?

A. No.

Q. Its level of contaminants

A. Yes.

Q. Anything else, flow rate, total quantity in the well and level of contamination?

A. Well, and how those might be applied for — well, no, I think that's right, those three.

Q. And I assume you're going to conduct investigations as to how you remove contamination from the gas you find, right?

A. Yes.

Q. Do you have any plans for removing that contamination now, any experimental designs, models or otherwise?

A. I believe that question should be asked of another witness. I don't believe I'm — oh, does Austral Oil have?

Q. Yes.

A. The answer is no.

Q. Now, what if any is the limit of Austral Oil's participation in this project from this point forward?

A. Well, as you know, we are the sole industrial sponsor of the project, and in conjunction with the Department of

Interior and the Atomic Energy Commission, we will proceed to test the well under their direction.

Q. You will test it for flow rate, total gas generated and contamination level, right?

A. We won't do the testing for the contamination, no.

Q. Do you know who will?

MR. EARDLEY: You mean by person, name or organization?

MR. YANNACONE: Organization, first.

A. I believe it will be a combination effort of the Department of Interior, which is in some way connected with the flow rates.

Q. Is it going to be all federal or will there be private participants?

A. I believe all federal.

Q. And will the data developed in this program be necessary to Austral Oil to determine whether the gas stimulation project is economically feasible in the future?

A. Yes.

Q. Will you continue to maintain contact with the researchers doing this work?

A. Yes.

Q. Will you continue to evaluate the commercial costs and commercial benefits potential of their work?

A. Yes.

Q. Will they report to you regularly during the progress of their work?

A. We hope so.

Q. Now, will you still be involved in tine Project Rulison during that period?

A. Which period?

Q. During the period these tests are being conducted.

A. Yes.

Q. When did your responsibility or connection with Project Rulison terminate? When I say you, I mean the Austral Oil Company.

A. I would like to refer you to the contract which is already of record.

Q. For the record, in your own words, you tell us when you think your responsibility ends.

A. At such time as the Atomic Energy Commission is no longer interested in the project from a safety standpoint. I don't mean no longer interested. I mean has no additional work and responsibility with respect to the safety of the project.

Q. At which point what will happen?

A. I'm not certain that I can give a specific answer to that. We have no present plan for marketing the gas from the well, if that's the question.

Q. At some point in time that contract will terminate, right?

A. Yes.

Q. What will happen to the well at that point?

A. We have no plans.

Q. You're just going to leave it there spewing forth gas, or will you cap it or will you fill it up or will you continue to take care of your capital equipment? You're not just going to leave a producing well even if it's only producing uneconomically?

A. Certainly, if it's uneconomical, we would abandon it.

Q. What does the abandonment constitute?

A. So that the —

MR. SEARLS: You want to know what you do when you abandon a well?

MR. YANNACONE: Yes, what do you do?

A. You con fine the zone of interest in such a way that no gas or oil or condensate or water can move from one zone to another with the use of cement and bridge-plug material inside the casing.

Q. In other words, you fill up the well, basically?

A. Yes.

Q. At that point, for practical purposes, the well is sealed and whatever reserve down there is just dormant, right?

A. Yes.

Q. Now, assume, however, that you want to continue production from that well. You just continue producing. In other words, you own the well.

A. Yes.

Q. I assume this is your land under lease by some way?

A. Well, we have it under lease, yes.

Q. Now, the Atomic Energy Commission's contact with you and its effective jurisdiction ceases, you say, at the point where they are no longer interested in safety, is that correct?

A. No. I think I need to clarify that. The Atomic Energy Commission is always interested in safety.

Q. Well, what if any continuing jurisdiction will they have over your production, if any, from that well?

A. As you know, there are no standards for the sale of gas that has radionuclides in them. There are no such standards.

Q. We are well aware of that.

A. Until such time that they are established, we would be unable to produce contaminated gas either for commercial or other use or on-site use.

Q. Are you telling us then that you are not permitted to sell gas contaminated with radionuclides in the absence of a standard level of such contamination that is

permissible?

A. True.

Q. Does it say that in any of the regulations you operate under?

A. Contractually, I believe it does.

Q. Well, exclusive of the contract, I am talking about any internal-external regulations.

A. I don't know of a regulation that says that. I know of our agreement.

Q. Now, with respect to the continued development of this program there at Project Rulison, is there any reason at this time for the release of radioactive contaminated gas from the well?

A. Released to the atmosphere?

Q. To the atmosphere.

A. We have no plans for release of any radioactive gas to the atmosphere at this time.

Q. At some point you're going to release 20 million cubic feet of gas per unit time in a series of tests?

A. Yes.

Q. Where will this gas go?

A. Into the atmosphere, flared, burned.

Q. If this gas contains radionuclide material, will it still be flared or burned?

A. Yes

Q. So you do intend to release radioactive gas

to the atmosphere, don't you?

A. After the reentry, yes.

Q. Now, is there any reason why this gas, to you, as Austral Oil Company, must be released to the atmosphere?

A. Yes.

Q. What are the reasons?

A. In order to evaluate the degree of stimulation.

Q. In order to evaluate the stimulation, must the gas be released to the atmosphere with its radionuclide load?

A. Yes.

Q. Why?

A. Unless you can come up with an alternate method of disposing and testing —

Q. Is it a fact, Mr. Frank, that there are methods of removing radionuclides from natural gas?

A. What are they?

Q. I asked you the question. Isn't it a fact, Mr. Frank, that there are methods to remove radionuclides from natural gas? Do you know or do you not know?

A. No.

Q. No, you don't know?

A. That's right.

Q. Is there anyone in the Austral Oil Company

of more responsible level than you who has direct charge or operation or connection with this Project Rulison?

A. No.

Q. As the senior officer involved, have you made any investigation of the scientific literature with respect to the method for the removal of radionuclides from natural gas?

A. Can we be more specific about the radionuclides? Are you talking about what the Atomic Energy Commission calls the particulate matter? Are you talking about just the gas having radionuclides?

Q. I'm talking about radionuclides by whatever form they might happen to be found.

A. Because of the experimental nature of this project in conjunction with the Atomic Energy Commission, we have relied on the Atomic Energy Commission for their knowledge and background in these matters. And my answer is that we don't have knowledge of any particular method of disposing of the gaseous radionuclides.

Q. Have you had occasion, in the course of your work it this project, to secure from the Atomic Energy Commission, you being Austral Oil Company, any information or review of the existing state of the art and

the scientific literature with respect to the removal of gaseous radionuclides from natural gas?

A. I personally haven't.

Q. Has your company, to your knowledge?

A. No, we have not. Our project consultancy CER Geonuclear Corporation perhaps has.

Q. In the course of your regular relationship, contractual or otherwise, with CER Geonuclear, do you know if they have furnished to Austral Oil Company any reports with respect to radiation, radioactive materials, or radionuclides in Project Rulison?

A. Do I know whether they have furnished material with respect to radionuclides?

Q. Yes.

A. Yes, I know.

Q. Have they?

A. Yes.

MR. YANNACONE: May we have copies of it and have them designated as exhibits for this deposition in chrono• logical order from A to whatever number they may be?

MR. SEARLS: We will have to investigate that. They have not been subpoenaed.

Q. Has a determination been made with respect to flaring, whether it will be conducted with or without ignition?

A. Yes.

Q. In other words, then you have no scientific basis for the determination that you must have high-rate flaring to determine the volume of the chimney, do you?

A. Yes.

MR. SEARLS: I object to the question because it is based upon a false assumption.

MR. YANNACONE: I think it was answered, but let's back up a minute.

Q. Why do you need high-rate flaring to determine the volume as opposed to slow-rate flaring, or high speed as opposed to slow speed?

A. Of course, we are depending on our consultants who are knowledgeable in these areas to help us determine these things.

Q. Did they furnish you with a report that said the determination of the rate or capacity of the chimney is a function of the rate of speed of flaring?

A. I think this is background knowledge of our consultants and an experience factor which determines the method of flowing, and there is no written report, to my knowledge, that gives their procedures.

Q. Are they the only consultants, CER Geonuclear?

A. The only consultancy for what? For Austral, no.

Q. For you to make this determination.

A. No.

Q. Who are the others?

A. Oh, I thought you meant available.

Q. No. I'm saying in this project.

A. Yes.

Q. And what technical capability does CER Geonuclear have that Austral Oil, the operation you're involved in does not have, if any?

A. I believe that could be more appropriately answered by some of the CER Geonuclear people. We know our capability, and their capability is in the nuclear explosive field as well as reservoir analysis. And a combination of those two, we don't have within our organization.

Q. Mr. Frank, who engaged CER Geonuclear Corporation?

A. I did.

Q. You mean to tell me that you don't know the capability of CER Geonuclear as opposed to your company?

A. I just explained that. You didn't listen.

Q. I'm listening, Mr. Frank. You tell me now

what it is specifically that they can do that you cannot do in house?

A. They have the combination of effective engineering with respect to the nuclear explosives and the reservoir engineering aspect, and we have only the reservoir engineering aspect.

Q. You do know about how to determine reservoir functions and reservoir parameters and make reservoir analyses, don't you?

A. In a conventional well.

Q. Right. Now, what is it that is different about determining the capacity of that chimney than is conventionally done to determine the capacity of any given volume area underground?

A. I must relate this to the volume of a portion of the string of five and one-half-inch production casing or seven-inch production casing. This is a very simple matter of which there is no concern. No one has the requirement or necessity to calculate a specific volume incorporated in a small piece of casing. The phenomenology of the chimney and the volume entrained in that chimney is something entirely different than reservoir engineering.

Q. Tell me what the difference is.

A. We don't know what the volume is.

Q. How do you expect to determine the

volume?

A. CER Geonuclear has the capability through computer programs to determine the chimney volume from various flow rates in conjunction with the pressure drawdown during that flow-time period.

Q. In other words, then the volume is determined as a function of the change of drawdown as a function of the rate of flow, right?

A. Yes, the volume of the chimney is determined in that manner. However, the rates of flow must vary between the chimney and the reservoir so you'll know which area you are speaking of.

Q. That's right. And the reason you need CER Geonuclear and their computer program is because this is a numerical calculation of a second order differential equation, isn't it?

A. Perhaps.

Q. Now, the key environmental measurement that furnishes the data for the computer to grind out the numerical analysis, in other words, generates the boundary values for the solution of the equation, is the difference in flow rate and pressure drawdown by given flow rates, isn't it, or by ungiven flow rates, isn't it?

A. Yes.

Q. And the difference between high speed and

low speed very high output speeds and very low output speeds, simply reduces the number of numericals that the computer has to make and makes the computer program a little bit cheaper, doesn't it?

A. I don't believe so.

Q. You mean to tell me as a petroleum engineer, Mt. Frank, with experience in reservoir determinations, that t's going to make a difference whether you use very high speed or very low speed so long as you have enough paints f different speeds with different pressure drawdowns?

A. Yes.

Q. Now, you tell me the engineering or scientific reasons why.

A. First, I would like to disqualify myself as a competent reservoir engineer. This is not my specific field.

Q. Let's back up a moment.

A. There are procedures by which you can determine the boundaries of flow from a given well, and this must vary the rate of flow so that you don't simply get the productive rate from the normal permeability of the reservoir. So these are the boundaries that we're looking for by higher flowage, the boundaries of the chimney.

Q. Well, isn't it a fact that you can determine this just as easily by starting with low flow

rate commensurate 11th the original rate of flow from the area and building 1p slowly and looking for the discontinuity as the computer continues it1 numerical analysis of the parameters and looking for the discontinuity that indicates the difference between the chimney size and the normal amount trapped in the permeable layer rather than starting at the top with high speed and working down?

A. I don't believe I can answer that.

Q. The next logical question is who can?

A. Among who?

Q. Don't you think it's necessary to answer these questions before you can fully determine the production capabilities and the production parameters of this particular field and the success of this nuclear stimulation program?

A. May I ask a question of my counsel?

MR. SEARLS: He wants to ask me a question.

MR. YANNACONE: Sure. Go ahead. Off the record.

(Discussion off the record.)

A. CER Geonuclear, who is our representee in these matters, our consultant in these matters, can answer these questions.

Q, Who in CER has been reporting to you in

the Austral Oil Company?

A. In the reservoir area, it's Dr. Bruce Bray.

Q. And is anyone else reporting to you from CER?

A. Other areas?

Q, Yes.

A Yes.

Q. Name them and tell us what areas.

A. Herb Grier in business matters; John Berlinger on legal advice; Hal Aronson in public relations.

Q. Isn't he an engineer?

A. Yes.

Q. Who else?

A. I believe that's all.

Q. Now, among these individuals, all the questions you can answer with respect to the effectiveness of evaluation of this well, we can get answers from, right?

A. I believe I would have to let them answer that.

I believe so.

Q. Now, are you and Austral Oil responsible for the cost of all the testing with respect to Project Rulison?

A. With respect to the cost?

Q. Yes. Are you responsible for the cost? Do you pay for it? If not, what portions do you

pay for?

A. Yes, our original contract stipulated that we would be responsible for the cost of the testing.

Q. Now, within that, unless I missed the portion of the contract that contained it, I see no specific outline of the testing procedures. Has there been an agreement as to what testing procedures you are responsible for?

A. The test procedures are in the process of development and will be approved by the engineering committee, the technical committee.

Q.. The technical committee of whom?

A. The technical committee consists of representatives of both industry and government.

Q. Who is on the technical committee now?

A. Representatives of the AEC.

Q. Who?

A. I can't give you their names.

Q. Who else?

A. LASL.

Q. What's LASL.?

A. Los Alamos Scientific Laboratory.

Q. Who is representing LASL?

A. I believe Dr. Lee Aamodt, but I'm not certain.

Q. Who else?

A. The Department of Interior.

Q. Who is representing them?

A. I don't know.

Q. What division of the Department of Interior?

A. The Bureau of Mines.

Q. Who else?

A. And CER Geonuclear.

Q. Who is representing them?

A. I believe Dr. Bray and Austral.

Q. Who is representing Austral?

A. Miles Renner, Jr.

Q. What's his capacity?

A. He's an assistant vice-president and project engineer on the job.

Q. Whom does he report to?

A. Me.

Q. Now, has there been a full determination of the test procedures that have been reduced to writing that y9u ill be responsible for paying for?

A. I believe it has not been approved by everyone as a final document.

Q. When is it going to be approved?

A. Prior to the reentry.

MR. YANNACONE: May we have a copy of the interim schedule?

MR. SEARLS: No. There is no final

plan and we do not furnish a copy of anything that has not been finally approved.

MR. YANNACONE: In other words, then the plan for the actual testing with respect to this well ill not be completed prior to the date of trial?

MR. EARDLEY: Oh, yes, it will.

A. I already generally outlined the test procedure, the rates of flow.

MR. EARDLEY: I can tell you right now it will be.

Q. (By Mr. Yannacone) When is the proposed reentry date?

A. Sometime after March 10.

Q. And at what time do you expect to have the final testing procedures agreed to?

MR. EARDLEY: He can't answer that, because it's got to be approved by the AEC. And I can tell you right now it's being worked on and it's going to be ready before the trial.

MR. YANNACONE: I'm going to move that we extend the date of the trial so that we get at least ten days to review that so-called plan for testing.

MR. EARDLEY: I think I can guarantee that we will give it to you ten days before.

MR. YANNACONE: Fair enough. [note: the Temporary Restraining order had

already been granted when this examination was conducted.]

Q. Now, has any consideration been given to the injection, pumped or otherwise, of the contaminated gas into another subsurface permeable formation?

A. No.

Q. None at all?

A. Not by Austral.

Q. Has anyone reported to Austral that such considerations have been given?

A. No.

A. No.

Q. Now, has Austral been apprised in writing or otherwise of the method for the removal of radionuclides, the cryogenic methods for the removal of radionuclides from gas materials?

A Not to my knowledge.

Q, Are you personally aware of the freezing or cryogenic method of removal of tritium from natural gas?

A I have heard of it but I'm not familiar with it.

Q, And you say Austral has not received any of these materials or information for consideration and made no corporate judgment on it?

A I said not to my knowledge.

Q. Now, will Austral be required or permitted to evaluate the proposed testing program

from the point of view of its own corporate policies?

A Yes.

Q, And what if any rights does Austral have to modify or alter that testing program?

A. As I earlier mentioned, the testing program is being developed by the technical committee made up of several people, and our input for the testing program is incorporated in that.

Q. Now, does the majority of the group rule, as it were on this committee, or must it be a unanimous determination before the Austral Oil Company is committed to finance the testing program?

A. I would say that there has been such a spirit of cooperation that there has been little difficulty in arriving at an equitable method of attaining any part of the project.

Q. Are you obligated, Austral Company, to pay for any tests which the committee recommends even though you do not approve of them?

MR. SEARLS: That calls for a legal conclusion. The contract speaks for itself. I instruct the witness not to answer the question.

Q. (By Mr. Yannacone) Has there been any regular course of corporate business of the Austral Oil Company, a report from counsel as

to the limit of the Austral Company's obligations to perform tests and pay for tests performed at the Project Rulison?

A. No.

Q. Is the Austral Oil Company a subsidiary or division of any other corporation, or is it an independent corporation?

A. It's an independent corporation.

Q. And is it listed or traded on any stock exchange?

A. Yes. On the American Exchange.

Q. And in the course of its regular corporate functions is it operated by a board of directors?

A. Yes.

Q. Are you a member of it?

A. No.

Q. In your regular business capacity, whom do you report to that is a member of the board of directors?

A. The chairman of our corporation, C. Wardell Leisk.

Q. And you report to him directly?

A. Yes.

Q. Do you report to any other members of the board?

A. No.

MR. YANNACONE: I have no further questions.

R

EXAMINATION BY MR. LAMM:

Q. Mr. Frank, what was the gross revenue of Austral Oil Company last year?

A. Slightly in excess of six and a half million dollar I believe.

Q. What is your major source of revenue at this point?

A. Gas and gas condensate production.

Q. What percentage would be from gas and gas condensate?

A. Roughly 90 percent.

Q. And where are your wells mainly located?

A. In the Gulf Coast area.

Q, How long has Austral Oil Company been incorporated?

A The company was started in 1952 and was a privately held corporation until 1967, at which time it became a public corporation.

Q, Has it experimented in any other way with gas stimulation methods by other more conventional means?

A Yes.

Q. Would you describe what types of means they were?

A. Hydraulic fracturing primarily.

Q. Any with conventional explosives

A. No, not at this point.

Q. Let me ask you a couple of questions about the economics. I assume there is a different determination when a field or a particular well is going to be drilled as opposed to whether a well is continued?

A Yes.

Q. In other words, if you spend a million dollars drilling a well and you would not have to spend that million dollars again, given the flow of the gas production — I assume it would continue to be profitable to maintain the well at a certain level of economic cost.

A. Yes, that's possible.

Q. Now, these determinations, I assume, are made on a rather day-by-day basis by a large corporation like your own?

A. Yes.

Q. Who generally makes a determination like that? First, who would determine in your organization whether a particular well would be drilled?

A. The exploration department.

Q. That is a team, I assume?

A. A team of geophysical geologists and reservoir engineers.

Q. And who would head that department in

your corporation?

A. The exploration department for our company is J. D. Goldman, Jr.

Q. Now, did he have anything to do with the exploration of the Mesa Verde formation in and around Rulison?

A. That was not his specific responsibility. We assigned the job specifically to another geologist, a consultant, who does a lot of work for us.

Q. And what is his name?

A. Gene Maxwell.

Q. And where is he located?

A. Houston.

Q. And he's independent of your company?

A. Yes. He's on a retainer consultancy for us.

Q. And what is his specific organization?

A. He's an independent consultant.

Q. Then, actually, who would make the determination whether a given well, having spent a given amount of money in a given well, could be continued in production?

A. The engineering group.

Q. What are the factors that they look to with regard to this?

A. This is inherent in all oil and gas production. It becomes obvious simply by the rate of production that it's the apparent

time to determine whether or not the income is in excess of the operating costs.

Q. I am more interested in actually the kind of costs. For instance, I assume that the location of the well, how far piping and other facilities would have to —

A. Those would all relate to the operating cost of the well.

Q. Yes. So the operating costs then are broken down into various things, the distance from the well, how far it would be to pipe in, to tap the gas?

A. Well, of course, you must assume you already have the capital investment of that. So the operating costs relate to those daily or monthly operating costs simply with respect to the cost of materials, chemicals, equipment, personnel involved, in operating the well.

Q. Now, I assume then with regard to nuclear stimulation that this was a decision made on a higher level of your corporation than would normally be made?

A. Yes.

Q. I assume it was made by the board of directors?

A. Yes.

Q. As a part of that determination, were you in on that determination?

A. No.

Q. Was there a specific report in your corporation, I assume, recommending to the board of directors that this area be explored?

A. Yes.

Q. Do you have a copy of that available that you could produce?

A. No, I don't have it with me. Specifically, the reports that were involved were geologic reports which were submitted to the USGS, the Department of Interior, and prepared by our company under the supervision of Gene Maxwell, and those are public records.

Q. What was the approximate date of these reports?

A. The latter part of 1965.

Q. Now, operating on the material that Mr. Maxwell gave, did your corporation have an internal memorandum and recommendation to the board of directors with regard *to* this?

A. Not specifically. We're a little more casual than that with the background material prepared by Mr. Maxwell and the other geologists, as well as the U.S. Bureau of Mines report indicating that the Piceance Basin was an appropriate area for exploration for large gas reserves which might be suitable for nuclear explosive technology. A combination of those two things, which

was a word-of-mouth matter that — yes, we've looked at it and have asked CER Geonuclear to confirm our findings.

Q. Now, who specifically did you deal with in that determination in CER Geonuclear?

A. I believe the business matters associated with the were between myself and Herb Grier.

Q. What kind of determinations did Mr. Maxwell give you on the cost of the developing? For instance, did he perfect such information as to the probable cost of a nuclear device?

A. No.

Q.Was this was developed internally by your corporation?

A. Primarily with the help of CER Geonuclear.

Q. With Mr. Grier?

A. Yes.

Q. Anybody else in CER Geonuclear?

A. Well, I'm certain that there were many associated with it. Mr. Grier could answer that.

Q. Did you, in your own mind, have a certain level of determination as to what the total cost of a particular stimulation well would be after the first one? This is a subject that I would assume on which there were np projections that you made before you went

into this area.

A. We naturally have to assume, because of the early stage of the Plowshare Program, that the result of a nuclear device fired in a given area would lead to more efficient operation and of development of drilling procedures and emplacement, device handling, all the other things, such that the second one would be less than the first, and consequently, it might be several detonations before an optimum economic range might be reached.

Q. Well, in making that determination of an optimum economic range, I assume that you plugged in a certain given figure for a nuclear device.

A This has been a very difficult thing, not just for us, but for all companies dealing with the Plowshare Program And the approach has been to determine what one must cost in order to make it economic, what the emplacement and the device itself, the services connected with the safety of it. First, you must determine in a reverse economic manner what it must cost in order to make the project economical. So it's a relative matter as to the gas in place and the areas that you're talking about and the many other things.

Q. Do you have a given figure then that your

company uses for the cost of a nuclear device in your projections?

A. We have assumed, because of the President's words, and those words are incorporated in the Non-Proliferation Treaty, that the device would cost a reasonable amount without consideration for the research and development that have gone into it for the past twenty years. And we had hoped, and we have no way of knowing — but we had hoped that a device that could be used in an area similar to Rulison would cost no mor than $100,000.

Q. Have you had any negotiations with the Atomic Energy Commission at all with regard to the price of nuclear devices and projections?

A. No.

Q. Now, in your cost economic projections, did you plug in a figure for decontamination of the gas?

A. Not specifically.

Q. When you say not specifically, would you expand upon that? How much determination or what consideration was given to this at all?

A. Well, again, because of the early stages of the research and development, we have great hopes that the technology will be advanced to the point where the radionuclides that are entrained in the gas

will be minimal, and consequently, through the development time period, that the gas stimulation technology will evolve so that we hope, as well as the rest of the Plowshare industry hopes, that the device development will be such that it will be a reasonable and appropriate way to use it.

Q. Actually, then, if I understand your answer to one of Mr. Yannacone's questions, you do have expectations that at some point technology will allow gas to come out of this hole without having radionuclides in it?

A. Yes. Well, perhaps I should say not totally without radionuclides, but certainly within a safe limit.

Q. An acceptable limit?

A. Yes.

Q. So that there would have to be no separation done at the surface whatsoever?

A. Yes.

Q. Actually, then, in your economic projections you have no actual cost then of decontaminating the gas?

A. Yes, but we've incorporated it within the general separation and the surface facility, because it's such an unknown to us at this time that we just didn't know exactly how to handle it.

Q. Is your corporation, or, to your knowledge, is CER Geonuclear participating in the

drawing of the acceptable standards that you mentioned earlier that are now being explored by the Atomic Energy Commission?

A. I know that we are not.

Q. You know that you are not?

A. That's right.

Q. Do you know of your own knowledge what CER Geonuclear's role in this is, if any?

A. I'd rather leave that answer to someone else.

Q. Now, actually, if you were going to ask that question of CER Geonuclear, whom would you ask, just in your professional capacity?

A. Herb Grier.

Q. Have you had any conversation with Mr. Grier with regard to decontamination of the gas?

A. Conversations over the years.

Q. But there has been actually no memoranda specifically or studies between your organizations on this subject?

A. That's right.

Q. To your knowledge, would there be anybody else in CER Geonuclear whom you would specifically ask other than Mr. Grier for this information?

A. I believe that's a question you should ask of Mr. Grier.

Q. I'm just asking for your knowledge. Do you know who under Mr. Grier is in charge of that,

just of your own knowledge?

A. No, not specifically who. They have several team people that are competent.

Q. Would you name them?

A I think Bruce Bray probably is one.

Q, And Mr. Bray is located in Houston?

A No. Las Vegas.

Q. How far along, to your knowledge, are the radio• nuclide standards with regard to natural gas? Have you followed that?

A. I'm not competent to answer that. ·

Q. Now, when you're talking with regard to acceptable standards of radionuclides in the produced gas, what levels have you judged in your own economic determinations to be acceptable?

A. We don't really have a good basis for judgment of that now. And it's certainly beyond our field of judgment, and we'd have to rely upon more competent people than ourselves to make such a decision.

Q. Now, in your considerations, has the process of dilution come into your determination at all?

A. It certainly is one of the considerations that should be given by the appropriate standards people.

Q, Then there is no one in your company that has actually been studying the separation of the radionuclides or the dilution, the economic

impact of these?

A. That's true.

Q. And to your knowledge, there is no specific one person in CER Geonuclear either?

A. To my knowledge, that's correct.

MR. LAMM: I have no further questions.

REEXAMINATION BY MR. YANNACONE:

Q. Mr. Frank, isn't it a fact that you cannot determine the economics of this stimulation project until you know what radionuclide contamination level of the output gas is acceptable for commercial use and what the cost of attaining that level is?

A. Yes.

Q. Isn't it also a fact that you cannot fully and adequately determine the economic value of this project unless you also know the total cost of the nuclear device to your company?

A. Yes.

Q. Don't you already have sufficient information to know that at the 20-kiloton level, the level of this project, the probability is very low that you can achieve economic stimulation?

A. No.

MR. FLEMING: That was a 40-kiloton device used in this project.

Q. (By Mr. Yannacone) Do you feel that a 40-

kiloton device is sufficient to act as an economic stimulant of one of these wells?

A. Probably not.

Q. And that the economics of this stimulation will require a charge of substantially larger size than 40 kilotons?

A. No, we don't know that. answer. That1s part of the experiment.

Q. What flow has to be Stimulated to economically justify, exclusive of radioactive decontamination to economically justify this project?

A. Because of the research attitude of this project, we do not expect this project to be economical.

Q. I don1t mean it that way. Exclusive of research and development costs, dealing with this as a stimulation with a 40-kiloton shot in the Mesa Verde project, similar to Project Rulison, what output of gas would be necessary to make this a productive and profitable well?

MR. SEARLS: Are you referring to one well?

MR. YANNACONE: I want to know the criteria of profitability for development by nuclear stimulation with 40-kiloton shots similar to Rulison. In other words, what output of gas do they need from a Rulison-type shot to be economically justifiable for a single well or field, for whatever proposed development they have in mind?

A. Well, as I earlier mentioned, we don't at this time have a proposed development procedure, and we won1t until we find out those things that were involved in our objectives of this well to find out what rates of flow could be attained And I had also mentioned, I believe, to Mr. Lamm's question. I related this back to the reverse economic procedure.

Q. That's what I'm asking you about, Mr. Frank.

A. If you will let me make some assumptions —

Q. Go ahead. Those are the assumptions we want to hear.

A. At a total cost of a million dollars involved in the total operation of a nuclear stimulation, such that we could attain flow rates that would be in the order of those listed in our feasibility study.

Q. Which are what?

A. My memory is —

Q. The order of magnitude.

A. Approximately 5,000,000 cubic feet a day for a period of the first ten years and declining to the order of 2,000,000 by the end of 20 years.

Q. That would produce a margin of profit on a million-dollar investment that you would be satisfied with?

A. My memory is that this is going to give Austral an appropriate return on their investment during that time period.

Q. Fine. Now, what are the elements of the investment? In other words, what goes into determining the investment that adds up to this million dollars? In other words, what elements?

A. The cost of maintaining the leases; the cost of drilling and equipping the well; the cost of the nuclear device; the cost of cleaning and appropriately treating the gas so that it can be marketable.

Q. Now, isn't it a fact from what you already know that the ultimate criteria for determining marketability is the cost of decontaminating the gas?

A. No, I can't say that.

Q. Are any of the costs in the list you have just named subject to evaluation at this time or reasonable estimate at this time?

A. With certain qualifications.

Q. Yes.

A. The drilling costs, if we assume the device size.

Q. And they would average about what, based on your Rulison experience?

A. The question is not what that well particularly cost.

Q. No. But just estimating from your

experience with that, what would it cost to drill a new one with what you know now?

A. Probably the cost would be on the order of $500,000 to adequately equip the well for the device and reenter the well so that it could be productive.

Q. Okay. Any other elements of that cost effective- ness determination estimable now?

A. If we make certain assumptions on the flow rates, the gathering system could be determined,

Q. Do you want to make some assumptions for us and give us some figures?

A. No.

Q. Well, on the assumption of the 5,000,000 cubic feet a day for ten years, declining to two or three million over 20 years, what would you say the estimable cost of the gathering equipment would be, the facility would be?

A. This again would have to be qualified. It would be highly dependent on whether you were talking about a single well or whether you were talking about the gathering system with respect to development wells in the field.

Q. Would it be cheaper to do this on a gathering system rather than as an individual well?

A. Certainly.

Q. In other words' then you could pr -rate the 'cost the gathering system over the total number of wells servicing it? of

A. Yes.

Q. Does the installation size of the gathering system vary, depending on the number of wells that it services?

A. Yes.

Q. What is the maximum cost that you would estimate for a gathering system for a single well of that capacity?

A. That again has to be qualified. It depends on how far it is from the marketing point.

Q. Where would the gas in Rulison be marketed?

A. We don't know at this time.

Q. Well, doesn't the Rulison field serve a particular market area?

A. There is a pipeline company in the area now called Western Slope.

Q. And wouldn't it be reasonable to assume that you would make your connection to that pipeline?

A. No.

Q. Where would you make your connection?

A. The best possible market.

Q. So that leaves approximately half a million dollars to be divided among the storage

facility costs, the atomic device and the decontamination facilities, right?

A. Plant separation.

Q. What is plant separation?

A. Recovery of the LP's in the gas stream.

Q. And what are the LP's?

A. The liquid properties, butane, propane.

Q. Do they come off as liquids?

A. Yes.

Q. What happens to them after they are separated?

A. We hope to sell them if we ever develop the field.

Q. Now, this separation facility, can you estimate the cost of this for a well of that size?

A. This again needs qualification.

Q. Qualify it.

A. You would not put such a separation plant in for a single well.

Q. How many wells would it take to make such a separation plant economically viable, or what total capacity would it take to make it economically viable?

A. This again is going to have some qualifications to it. Deliverability of the well certainly will have a great deal to do with it. This is the ability of each well to deliver certain volumes per day. The

recovery of the liquids per million is one of the dependent factors, although from our original test we know what those are. Certainly, you wouldn't put the plant in for a million or ten million with the knowledge that you might expand it to 100 million or 200 million. So there is a time judgment on when and if the plant would be installed, and this would be after substantial testing of the liquid content of the gas stream.

Q. What happens to the liquid content of the gas stream as you drill these new wells before you decide to put the separation plant in?

A. What happens to them?

Q. Yes.

A This will be dependent upon the pipelines ability to handle such liquids because of the effect of the BTU content of the gas and the liquids in the line.

Q, Now, isn't it a fact that the profitability or the profit potential of nuclear stimulation of natural gas production relates directly to the level of radionuclide load permitted in the gas stream for commercial or private consumption?

A. That's an assumption I can't necessarily argue with. I don rt know specifically that that is true.

Q, Well, isn't it a fact that the removal of the radionuclides from the gas stream will cost the company something?

A Oh, certainly.

Q. And won't this cost detract from the gross sales of the gas?

MR. SEARLS: He already answered that he could not pass on that question at this time.

MR. YANNACONE: I don't think he answered that. I'll rephrase it.

Q. Are you capable of determining what elements of cost go into determining gross profit from a given amount of gas sales?

A. Yes.

Q. And isn't it a fact that the cost of decontamination is one of those costs that must be subtract d from gross sales in order to yield the gross profit?

A. Yes. Again, we'll have to make some assumptions.

Q. Like —

A. Like the amount and the type of radionuclides in

Q. Now, that isn't what 1 —

A. — in order to determine what the relative cost is.

Q. No, I didn't ask you that. I asked if there is some cost from whatever source. The cost of decontamination is a reduction of gross profit, right?

A. Similar to that of removing water or other contaminants in the gas.

Q. It's a production cost?

A. Yes.

Q. Therefore, the level of radionuclides permitted in the salable gas is a direct contributor to your profit, isn't it?

A.. Yes.

MR. YANNACONE: No further questions.

EXAMINATION BY MR. SEARLS: (Attorney for Austral Oil)

Q. Mr. Frank, you have testified that before you could go forward with a development of this field, you would have to determine certain conditions, isn't that correct?

A. Yes.

Q. Before you could proceed with the development of the field, would it also be necessary to have congressional action.

A. Certainly.

MR. SEARLS: That1s all.

REEXAMINATION BY MR. YANNACONE:

Q. What kind of congressional action, Mr. Frank?

A. There is no procedure now, legislative procedure, by which the use of nuclear devices can be used on a commercial basis.

Q. But as long as the project is denominated research and development or Project Plowshare or Project Gas Buggy, they can be developed without further congressional approval, right?

MR. SEARLS: You're limiting it to an experimental basis, not to the development of the entire field?

MR. YANNACONE: No. I'm talking about individual experiments, that they can be developed without further congressional approval, right?

A. No, that's not correct. As a matter of fact, some congressional action must be taken on every research and development project.

Q. That's an appropriation, isn't it?

A. It's with congressional action of some sort.

Q. But when I say congressional action, I mean direct legislation.

A. Further research and development projects can be carried out in the Plowshare Program, yes, without —

Q. Okay. There is no limit, is there, other than congressional appropriations for the nuclear device as to the number of these experimental or research and development shots that can be brought about in the Mesa Verde formation near or in the Project

Rulison field?

A. That could be better answered by John Kelly or someone with the