

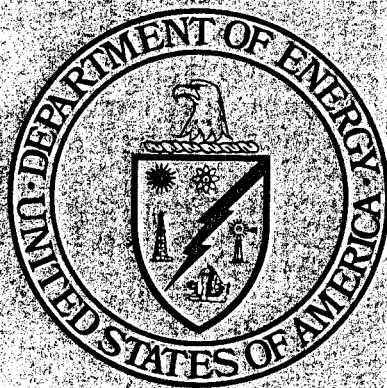
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Fossil Energy Research Meeting



June 28, 29, 1977

Sponsored by
Energy Research and Development Administration*
Division of Physical Research Publication

Publication Date — December 1977

*Under P.L. 95-91, the Functions of the ERDA were transferred to the Department of Energy on October 1, 1977.

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Fossil Energy Research Meeting

June 28, 29, 1977

Richard H. Kropschot
Gerald C. Phillips

Sponsored by
Energy Research and Development Administration *

Division of Physical Research
Washington, DC 20545

Publication Date — December 1977

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PREFACE

On June 28 and 29, 1977, at the Quality Inn in Washington, D. C., the United States Energy Research and Development Administration held a public meeting to review the basic and applied research programs having impact on future fossil energy technologies. The goal of the meeting was to solicit public input to aid the Agency in long-range planning. The meeting consisted of two parts:

- presentations of the various research programs by ERDA personnel; and,
- four discussion groups intent on obtaining feedback relative to the material presented.

The MITRE Corporation/METREK Division (under Contract No. EX-77-C-01-6110) provided analytical, evaluative resources and prepared materials for presentation at this meeting. They also provided timely assessment of responses from the public meeting participants.

The proceedings of the presentations by ERDA personnel are contained in this one volume.

ACKNOWLEDGEMENT

The authors of this report wish to express their thanks to Dr. James S. Kane for his support of this project. We also wish to acknowledge the able assistance of Charles Bliss, Dr. Jim Lang, and Roy Peterson of the MITRE Corporation/METREK Division, who acted as leaders in the group discussions, and Dr. F. Dee Stevenson, Dr. E. Karl Bastress, Paul Scott, and Frank Ferrell, the ERDA representatives who also assisted in the group discussions. We wish to thank Ruth Gilliam for her assistance during the meeting. And finally, to those two untiring people, without whose assistance neither the meeting nor the report could have been accomplished successfully, Donna Stein of ERDA, and Marie Benford of the MITRE Corporation/METREK Division.

**THE MITRE CORPORATION/
METREK DIVISION**

and the

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

**PUBLIC MEETING
on
FOSSIL ENERGY RESEARCH**

**Quality Inn
415 New Jersey Avenue, N.W.
Federal Ballroom South
Washington, D. C.**

Tuesday, 28 June 1977

The meeting in the above-entitled matter was convened pursuant to notice, at 8:30 AM. Messrs. J. S. Kane and G. C. Phillips, chairmen, presiding.

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PROCEEDINGS

DR. KANE: My name is Jim Kane. I'm going to chair this morning's session.

The meeting is an open public hearing, and we are going to have question and answer sessions after each speaker. I'll ask each of you, to go to one of the microphones and identify yourselves before you ask your questions.

The entire proceedings are being taped. You should know that ahead of time.

We're very fortunate to have our welcome introduction speaker here this morning, because his presence was requested rather preemptorily by the Senate, and he's been up on the Hill since 7:00 o'clock this morning. He has expressed to me privately that it was a great, great pleasure indeed to be here to give you these welcoming remarks.

Excuse me, I thought you all knew him. I didn't even introduce him. He is my boss: Bob Fri, Acting Administrator of ERDA.

MR. FRI: Thank you, Jim. It is indeed a great pleasure to be here. We are conducting this hearing in the usual Washington fashion. We have virtually everybody that ought to be talking to you testifying before the Senate instead of being here; but we are trying to run a little relay race back and forth. It is only a few blocks. The hearing should be over by 10:00, so I think, we have ourselves reasonably covered.

First of all, let me just thank you all for coming. This project that we are embarked on is terribly important to us, and we can use all the help we can get, both from inside and outside the agency.

I might give you a little background on it. You should know that although ERDA may be well known for getting into controversies, such as whether or not to build high Btu gas plants and breeder reactors it also has basic research responsibility in energy. Indeed, the basic research responsibility for all energy sources rests here.

We inherited a substantial basic research program from the constituent agencies, but primarily from the Atomic Energy Commission. Our people have worked over the last two years to reshape that program in a way that provides the fundamental science underpinnings of our entire range of projects.

A little over a year ago, we set forth a series of management goals for the agency.

One of those was to make sure that our basic energy sciences program was in fact, a sound one. Not only in the organization that Jim Kane runs, which conducts much of that operation and has that title, but also in the supporting research functions of a variety of our other program offices, all of whom virtually have some basic research responsibilities and sponsor research in those areas.

Jim approached this very difficult problem of shaping a basic research program in, I think, a very good way and set up a

project with a couple of distinguished people from outside the agency to spend a year with us and help us understand how we could do better. They have in fact done that.

One of the results of that project was to point out that fossil energy research was one of our most important products, and one in which the fundamental research base requires--in a kind of program that we ought to be running--some clarification. It's important because, you know at least as well as I, that fossil energy is terribly important to the United States, and it's important because the research base for that program was not one of the big things that was brought over to the agency. A significant program was brought from the Department of Interior, but it had never been at the AEC. The confluence of those two observations early led us to say, we need to do the best job we can; and to take a hard look at the fossil energy research base.

We thought one good way to get a fix on the kind of research that needs to be done and the kind of role a federal agency could play was to bring together, in a public meeting, a group that could help us out. As I see from the agenda we'll try to give you some background this morning; then turn around later on in the afternoon and look to those of you who have come to give the advice and help that we frankly seek in this matter.

So you're very kind to have come. It's going to be a great help to us. We are doing this for a selfish reason, to help put

together our research program; but we hope you find some interest in it, too.

Unfortunately, I have to go back to the Hill, but again, thank you, and I hope you have a successful meeting.

(Applause.)

DR. KANE:

We are going to try to keep this on schedule, so we have a couple of people with a clock down here to keep us all on time.

I'm going to repeat a lot of the things Bob said. He took a lot of my opening talk, but I think it's probably important that I repeat some of the things he said because in my few minutes of opening here, I would like to tell you, again, why you're here precisely; and what this meeting is expected to cover and what, by implication, it is not expected to cover. So, some of this will be repetitive of what Bob just said, but I think it's worth it that I go over it again.

This is a mandate given to me by the Administrator of ERDA to assess the--I will have to be careful to explain some of these words--the quality of the Basic Energy Sciences Program. And now I have to explain very carefully what I mean by "quality" and "Basic Energy Sciences Program," because that's really why we're here.

Subsequent discussions with Mr. Fri and Dr. Seamans, when he was here, defined this in the following way. By "basic energy sciences," I mean the basic relevant sciences, the applied sciences, and the kind of broadly applicable generic sciences that pertain to energy technologies.

Today we are going to limit this to fossil energy but the charter they gave me wasn't limited to just fossil energy. So it's the very basic work, the applied science work and the broadly relevant generic type work, which is not specific to one particular technology.

Let me describe what Dr. Seamans and Mr. Fri meant by "adequacy." They didn't mean by "adequacy," the usual idea; Is this individual piece of work of high scientific quality? They meant by "adequacy" that, from the viewpoint of the agency; Was the research across the agency integrated? Remember, it's done by different players sometimes. Were these people talking to each other? Was the research program balanced? This is a question you will hear again and again today. Do we have a balanced program? Are there parts that, in your opinion, are receiving far less emphasis than they should? Are we doing too many things in one area and not enough in others? Is the program comprehensive? Are we overlooking great opportunities for research? That's really what they meant by "adequacy." So that's the thing I'll ask you to concentrate on today. The balance, the comprehensiveness, the integration, as well as, of course, suggestions on subject matter.

Now, to do this for the agency, of course, would be an enormous job and I decided that it was highly improper to do it with our own people, and our own resources. To ask an organization to look at itself critically is kind of a risky business. So I thought it best to use outsiders, who Mr. Fri told you about. They're not

full-time ERDA employees, and they are the two gentlemen you will see more of during this meeting, Dr. Gerald Phillips, who's on leave from Rice University, where he's a professor of physics, a longtime head of the Bonner Laboratory there and a man who has at least a passing acquaintance with the oil patch.

The other participant is Dr. Richard Kropschot, who is a commerce science fellow. He's Chief of the Cryogenic Technology Section of the National Bureau of Standards at Boulder, Colorado.

I gave these two people very broad guidance, just what I'd been told by Mr. Fri and asked them to come back and tell me what they thought needed doing.

This was their three months progress report: they found much they liked about ERDA. They had two principal observations relevant to this area I'm talking about.

One, they sensed there was an unevenness in emphasis on applied sciences.

Secondly, because of the unique organization of ERDA, the vertical organization of ERDA, in which one assistant administrator is given responsibility for a specific technology they found what they thought was a neglect of crosscutting technologies. Ones that were of interest to many people across the agency, and yet no one administrator felt his career rose or fell on their success. And these had a tendency to drop through the cracks.

That was their preliminary report to me. As I say, they found much they liked; they found some things that concerned them.

My guidance to them at that time was to concentrate their efforts on fossil energy rather than the entire agency. For two people to try to do the entire agency, of course, would be folly. The reason we chose fossil energy was because the agency has given such enormous--well, the country for that matter--such enormously high priority to coal, in the nation's future, and particularly, the critical shortage of liquid fuels that may occur. So fossil energy was chosen because, in our opinion, it was a high priority topic, particularly the aspect of utilizing coal. And, again, I'm narrowing down here--I've told you already we're narrowing into one end of this broad continuum what ERDA's responsible for in research. Remember, ERDA's responsible for everything from basic research to commercialization. I've told you we're going to concentrate on one end of that spectrum today. And I'm saying we're going to concentrate on fossil energy and, specifically, we'll try to keep it highly focused on coal, coal to liquids and coal to gas.

Now, I realize with an audience of this quality, I don't want to focus you too narrowly. We appreciate your comments on any subject, but the general purpose of this meeting is to focus as narrowly as possible on the topics I've mentioned.

All right. The two of them came back in the spring and reported the following: they had concern about the balance of the overall fossil energy program. Particularly, they were concerned about

a gap between the basic research program, which is under my jurisdiction, and the applied science programs. Let me explain a little bit about responsibilities in the agency. My organization is responsible for the basic research for the entire agency. In other words, basic research related to solar, fission, and fusion sources, and fossil energy, the whole gamut.

I am not responsible for the applied science. The applied science is left to each of the assistant administrators, and it's his decision on the emphasis he gives to the applied science, that leads to the goals that he has defined for his particular cut of technology. So they perceived what they thought to be a gap in between the basic work and the applied science.

They also perceived what they thought and, again, I will put this in qualitative terms because this is a supposition on their part, but they at least expressed concern over what they perceived to be a lack of novel applied science directed toward concepts that would appreciably lower the cost of converting coal to liquid and gas. I guess kind of a slang way of saying that would be--well, maybe you'd want to call them high risk, high pay out approaches.

I don't know what you'd prefer to call it, but at least I'm trying to put in words the opinions they gave to me. They reported these opinions to me and of course, the first thing we did was talk to the people in fossil energy about this. And I want to emphasize this again. This is not in any way an adversary hearing today in which we are saying one approach is right, and another one is not right.

We have had the total cooperation of the fossil energy people in this. Rather than an adversary hearing, this is a constructive session in which we hope to solicit opinions on how we can make our programs better.

Dr. Kropschot and Phillips reported their opinions to me. We explained them to Dr. White, who is head of the fossil energy program, and I've been--by the way, let me digress a minute here--while we're waiting --three of the participants on this morning's program are up at the Hill right now. Dr. White is one of them, and we're going--because he is so important to this program, we're going to work him in as he comes and delay his part of the program. So our agenda this morning is apt to be a little out of order because there are three absent participants; Chris Knudsen, Dr. White, and Harry Johnson. I think we have a substitute for Harry Johnson because he is so early on the program, but the other two, we'll try to work around them.

All right. We told our opinion to Dr. White, and this meeting resulted. It's an honest seeking of diversity of opinions and viewpoints. We ask your help.

Now, let me tell you what it is not. I have said this twice, but I want to make it very clear. It is not a review of the entire fossil energy program. As I said, a group like this is going to make their opinions felt on any subject they wish to. It's

an open hearing. But we'll try to keep it away from specific discussions of the technology, commercialization, and demonstration program, and the advanced technology. This is not meant to be a review. On the other hand, in order for you to give us your opinion, you have to understand the program. So you're going to hear a lot this morning about the entire program, more as background material, so that the format is a presentation of the fossil energy program. Then, after that, a report on the research program, and a time for a discussion and criticism.

Now, although I'm going to be on the stand this morning, I want to make one final comment and that is, from now on, I'm really a participant in this; my program is as much under scrutiny as any other program here today, and I invite your comments. I'm really more of a Mr. Interlocutor than I am running this thing from now on.

I'd like to, before I go any further, introduce Dr. Phillips and Dr. Kropschot, who have been responsible for this review. They're sitting in the front row here. Dr. Phillips is in the brown suit, and Dr. Kropschot in the blue.

Our first speaker then on this morning's session will be a pinch hitter for Harry Johnson, of ERDA's Planning Office. Let me explain a little bit about what Harry does. Harry is a planner, the one who outlines the missions, the programs, and advises on the budget for the agency's energy programs. His place is being taken by Bruce Robinson, who will give you the first presentation of the morning.

DR. HILL: Dr. Kane?

DR. KANE: Yes.

DR. HILL: While he is setting up, would you describe for us the functions that NSF RANN, and NSF used to carry that are no longer carried by them and must be by ERDA?

DR. KANE: I don't believe I can really do that. I'm not well enough acquainted.

Bruce, do you know any of those functions that were transferred in from NSF or terminated over in NSF and RANN, which have been picked up by ERDA?

DR. ROBINSON: The programs that come to mind are solar, geothermal, biomass.

DR. HILL: There was a lot of coal research.

DR. KANE: -- there was a lot of coal. Alex Mills then could perhaps address that one.

DR. MILLS: We had 23 projects from RANN, which were transferred to ERDA. I'd like to say, in all frankness, they were transferred with no money, no personnel, and they are now coming in for renewal.

DR. HILL: So it is expected that your shop will pick up everything NSF was doing?

DR. MILLS: Coal; right.

DR. ROBINSON: Well, my task, as I understand it this morning, is to give you a brief overview of ERDA's programs and budget,

to give you some context for the more focused discussion you are going to have during the course of the day. So what I intend to do is give you a very abbreviated indication of how ERDA's programs are consistent with a strategy which derives logically from consideration of national energy problems. In the course of that, to hit on some of the highlights of the programs; and then to give you a quick overview of ERDA and the ERDA budget that was submitted to the Congress recently for fiscal year 1978.

I might say that a more detailed discussion of the kind of topics I will be covering and related topics will be included in the ERDA Annual Plan, which is due to come out in about two weeks and will be available from the Technical Information Service in Oak Ridge at that time.

Can I have the first slide, please.

(Slide 1)

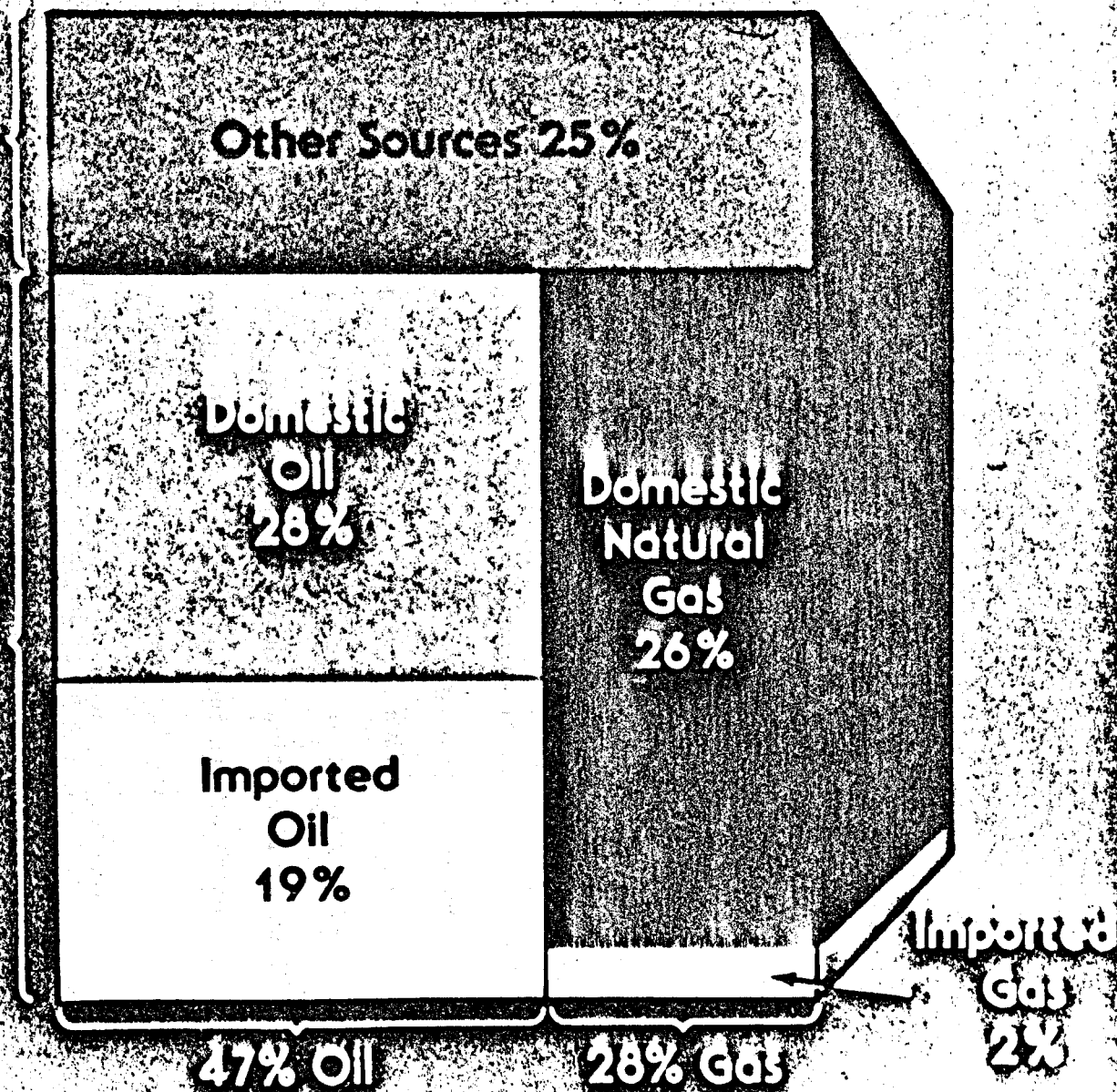
Of course, the major component of the national energy problem is the fact that our entire economic infrastructure is dependent on oil and gas. As this slide indicates, about 75 percent of the consumption in 1976 was in oil and natural gas.

As you know, and as we'll see in a subsequent slide these are our least plentiful resources, and our fix to date has been importing. As indicated, in 1976, we imported something like 40 percent of our oil.

U.S. Energy Demand

25%
Other
Sources

75%
provided
by oil &
natural
gas



Our domestic resources simply cannot support the kind of production required to meet our demands, and we cannot depend on the temporary import fix because there is a similar worldwide oil problem not too far down the road.

Can I see the next vugraph.

(Slide 2)

This slide projects a cumulative consumption worldwide. The upper band indicates estimates of world oil resources. The yellow bar is the halfway mark; a typical bell-shaped production curve. You begin to level off production at the halfway mark. As you can see, if the world continues this present 8 percent growth, production will be leveling off in the late 1990s. Even if there is no growth at all, we will reach the leveling off point very early in the next century. So the import fix, even if we are willing to ignore problems of national security and balance of payments, is at best a temporary fix.

The next slide, please.

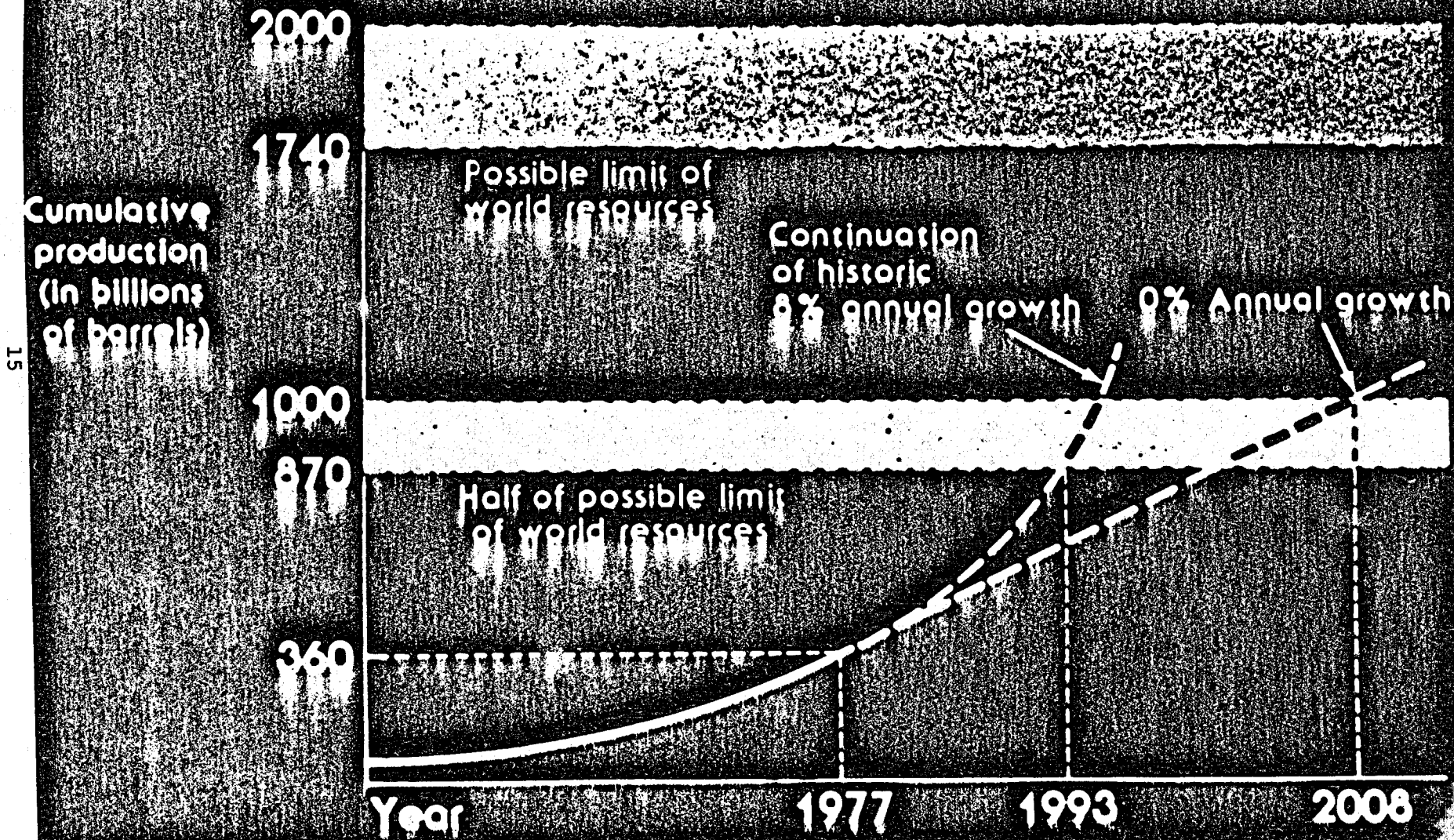
(Slide 3)

This is the result of a recent CIA report where they have projected that the problem we are projecting in the '90s would actually occur in the '80s. There is some disagreement as to exactly when it will occur, but there's no doubt that imports, at best, are a temporary fix.

Could I have the next slide.

(Slide 4)

Current and Projected World Production of Petroleum



OPEC Oil: The Supply/Demand Gap

Million b/d

50

40

30

20

EXCESS CAPACITY

DEMAND FOR OPEC OIL

price
break

Supply
Short
Fall

1976 77 78 79 80 81 82 83 84 85

Source: Central Intelligence Agency

Potentially Recoverable Domestic Energy Resources (In MBOE)

17

