TECHNOLOGY TRANSFER AND PATENT POLICY: DOE AND OTHER PERSPECTIVES

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY RESEARCH AND PRODUCTION

AND THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

NINETY-NINTH CONGRESS

FIRST SESSION

JULY 15, 1985

[No. 45]

Printed for the use of the
Committee on Science and Technology

U.S. GOVERNMENT PRINTING OFFICE
54-280 O WASHINGTON : 1985

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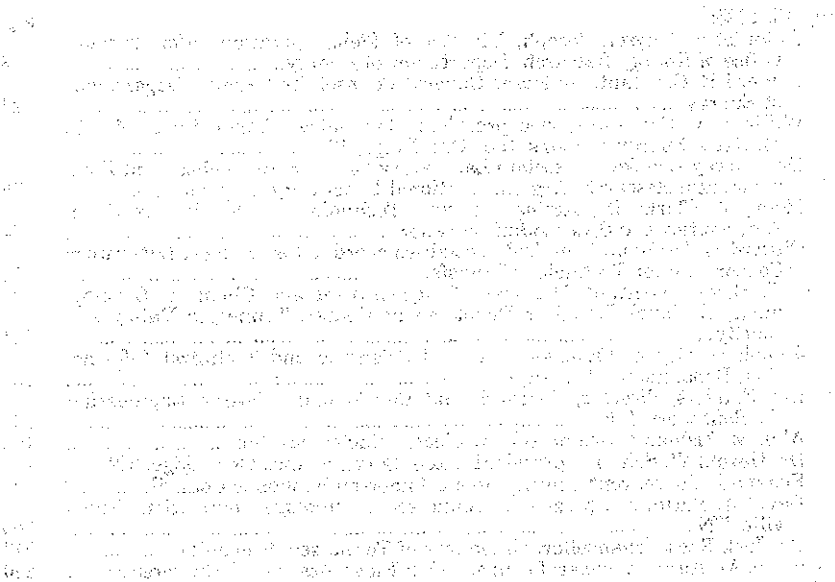


TECHNOLOGY TRANSFER AND PATENT POLICY: DOE AND OTHER PERSPECTIVES

MONDAY, JULY 15, 1985

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION, AND THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,

Oak Ridge, TN.

The subcommittees met, pursuant to notice, at 9 a.m., American Museum of Science and Energy, 300 S. Tulane Avenue, Oak Ridge, TN, Hon. Marilyn Lloyd and Hon. Doug Walgren, presiding.

Present: Representatives Lloyd, Walgren, and Morrison.

Staff present: Dr. John V. Dugan, Jr., staff director; Nelson Milder, technical consultant; James Turner, counsel; and Tim Peckinpaugh, Republican technical consultant.

Ms. LLOYD. The subcommittee hearing will come to order.

Good morning, ladies and gentlemen. It is certainly nice to have all of you here and we are certainly very happy that our witnesses have agreed to participate in the hearings today.

There has been increasing attention over the past several years to exploring mechanisms for maximizing the return on the Federal Government's investment in R&D. Today's hearing is a first step for the ERP Subcommittee in examining the various options available to the Department of Energy to enhance its ability to transfer federally funded technology. Both Congressman Walgren and I have been long-time advocates of strong technology transfer programs within the Federal Government beginning with NASA, and this is certainly shared with Congressman Morrison as well. NASA was the agency pioneer for technology transfer under our committee's jurisdiction. My distinguished colleague, Mr. Walgren, approaches this topic from a more general perspective across the Federal agencies, and he has been involved with the other subcommittee chairmen in recent patent policy legislation.

The billions of dollars which this country spends in its various research programs to develop technology for applications to national missions is certainly applicable to other areas of our economy as well. In addition to the organic acts creating the agencies, the Congress has provided strong legislative incentives, such as the Stevenson-Wydler Act, to direct the various mission agencies within the Federal Government, such as the Department of Energy, NASA, and the National Science Foundation, to carry out vigorous technology transfer programs. Our ultimate aim is to closely examine the technological innovations resulting from research and develop-

ment programs within each of the agencies and determine their applicability to solving problems in areas of our national need. My particular interests are Department of Energy and Oak Ridge, but I would hope that they can also capture lessons learned by other agencies. Such innovative technology may be applied in areas not directly related to the original intent of the Federal funding for these technological innovations. The effort to transfer technological know-how from the developer to another party, which is commonly referred to as technology transfer, has been extremely successful throughout the Federal Government and yet there remains a much greater potential for applicability of these fruits throughout the economy. I would also remind everyone that there are many mechanisms for technology transfer, ranging from cost-shared Federal and industry research and development to the more directly identifiable process where the developer seeks out potential customers who may not be sure that such technology meets their needs.

It is particularly appropriate that we have this first hearing at Oak Ridge since it is the unique center for technology transfer with active programs at ORNL, ORAU, and with the OSTI functions, a major technology transfer tool is also housed here. There has been considerable interest by the State and other parties in enhancing the high technology thrust in this region, and it is a healthy climate to encourage such spinoffs.

In addition to subsidizing programs directly related to transferring technology, the Congress has had a prime legislative objective directed toward modifying Federal patent policies in such a way as to assist the agencies and the Federal laboratories in carrying out these transfer, technology transfer activities. In some cases, these efforts have been successful, but perhaps in other areas, Federal patent policy has actually served to deter or to inhibit the effective use of federally funded technologies in the development of commercial products in other segments of our national economy.

It is our intent today to hear the testimony of witnesses who have strong vested interests in federally sponsored technology transfer programs and the patent policies and other elements which comprise the set of Federal tools to carry out these programs. Our witnesses cover a broad spectrum of economic activity, ranging from the technology areas funded by the Federal sponsors of these programs, through the national laboratories who must implement and carry out the technology transfer tasks, to the industry that stands to gain heavily from successful and well managed technology transfer activities within the Federal Government. Moreover, there are many universities who also benefit from and are involved in such Federal programs. It is my hope, based upon the information obtained from today's inquiry, our subcommittees can gain a better insight as to how to proceed to assure that the Federal Government, the national laboratories, the industries and our universities can all work jointly to implement strong programs. These programs should not only provide an important ingredient of technological innovation to many segments of our economy, but their implementation will also allow us to make maximum use of the technical talents residing in those individuals and employees of industry and the Federal Government who have made these technological innovations possible.

Before we hear our first witness, I would like to ask my good friend, Mr. Walgren, to give his opening statement. Good morning, Doug. We certainly welcome you to Oak Ridge and the Third District of Tennessee.

[The prepared opening statement of Representative Lloyd follows:]

HON. MARILYN LLOYD'S OPENING REMARKS—HEARING ON "TECHNOLOGY TRANSFER AND PATENT POLICY: DOE AND OTHER PERSPECTIVES"—JULY 15, 1985

Good Morning. There has been increasing attention over the past several years to exploring mechanisms for maximizing the return on the Federal Government's investment in R&D. Today's hearing is a first step for the ERP Subcommittee in examining the various options available to the DOE to enhance its ability to transfer federally-funded technology. Both I and our Co-Chairman have been long-time advocates of strong technology transfer programs within the Federal Government beginning with NASA, which was the agency "pioneer" for technology transfer under our Committee's jurisdiction. My distinguished colleague, Mr. Walgren, approaches this topic from a more general perspective across the Federal agencies, and he has been involved with the other subcommittee chairmen in recent patent policy legislation.

The billions of dollars which this country spends in its various research programs to develop technologies for applications to national missions is certainly applicable to other areas of our economy as well. In addition to the organic acts creating the agencies, the Congress has provided strong legislative incentives, such as the Stevenson-Wydler Act, to direct the various mission agencies within the Federal Government, such as the Department of Energy, NASA and the National Science Foundation, to carry out vigorous technology transfer programs. Our ultimate aim is to closely examine the technological innovations resulting from the research and development programs within each of these agencies and determine their applicability to solving problems in areas of our national need. My particular interests are DOE and Oak Ridge, but I would hope that they can also capture "lessons learned" by other agencies. Such innovative technology may be applied in areas not directly related to the original intent of the Federal funding for these technological innovations. The effort to transfer technological know-how from the developer to another party, which is commonly referred to as technology transfer, has been extremely successful throughout the Federal Government and yet there remains a much greater potential for applicability of these fruits throughout the economy. I would also remind everyone that there are many mechanisms for technology transfer, ranging from cost-shared Federal/industry R&D to the more directly identifiable process where the developer seeks out potential "customers" who may not be sure that such technology meets their needs.

It is particularly appropriate that we have this first hearing at Oak Ridge, since it is a unique center for technology transfer (T2) with active programs at ORNL and ORAU, while the OSTI function, a major T2 tool, is also housed here. There has also been considerable interest by the State and other parties in enhancing the high technology thrust in this region and that is a healthy climate to encourage such spin-offs.

In addition to subsidizing programs directly related to transferring technology, the Congress has had a prime legislative objective directed towards modifying Federal patent policies in such a way as to assist the agencies and the Federal laboratories in carrying out these technology transfer activities. In some cases, these efforts have been successful, but perhaps in other areas, Federal patent policy has actually served to deter or inhibit the effective use of federally-funded technologies in the development of commercial products in other segments of our national economy.

It is our intent today to hear the testimony of witnesses who have strong vested interests in federally-sponsored technology transfer programs and the patent policies and other elements which comprise the set of Federal "tools" to carry out these programs. Our witnesses cover a board spectrum of economic activity, ranging from the technology areas funded by the Federal sponsors of these programs, through the national laboratories who must implement and carry out the technology transfer tasks, to the industry that stands to gain heavily from successful and well-managed technology transfer activities within the Federal Government. Moreover, there are many universities who also benefit from and are involved in such Federal programs. It is my hope that, based upon the information obtained from today's inquiry, our Subcommittees can gain a better insight as to how to proceed to assure that the Federal Government, the national laboratories, the industry and our universities

can all work jointly to implement strong programs. These programs should not only provide an important ingredient of technological innovation to many segments of our economy, but their implementation will also allow us to make maximum use of the technical talents residing in those individuals and employees of industry and the Federal Government who have made these technological innovations possible.

Before we hear our first witness, let me ask my friend Mr. Walgren to give his opening statement. Good morning, Doug, and welcome to Oak Ridge and the Third District.

Also, the Ranking Republican on our Subcommittee, a good friend and very involved member, Mr. Sid Morrison is here. I welcome you to Oak Ridge and look forward to your statement.

Mr. WALGREN. Thank you very much, Marilyn. It is really interesting and a real privilege to join you in these hearings in Oak Ridge. I have come from Pittsburgh, PA, and have never been to Tennessee before, and it is always interesting to go to visit another Member's district.

In this case, since the warmth and the supportiveness of the community here for you and measuring that against my own, which we are always measuring, as people who will run for election sometime soon, I really wish I could change places with you and——

Ms. LLOYD. Well, if the gentleman will yield, I am not in the mood to change places, but I am sure you are equally welcomed in your home State.

Mr. WALGREN. I am the chairman of the Science, Research and Technology Subcommittee, as Mrs. Lloyd is the chairman of the sister subcommittee in our overall Science and Technology Committee in the Congress. I have served on that committee for the last 10 years, and only feel that now I am beginning to learn of the depth of the resources that are available to this country.

In looking back over those years, I especially appreciate the piece of Oak Ridge that Mrs. Lloyd has brought to Washington and the appreciation for the science pool that has been built in institutionally into the memory of the committee over the years by Mrs. Lloyd. It has also been a real eye-opener for me to work with her on some very difficult projects, particularly the process of passing a comprehensive nuclear waste bill.

When I went to the Congress, some of the interests in my community were lamenting the fact that we had no policy in that area at all. Indeed, most people felt that it was not likely that the National Government develop a policy for the disposal of the kinds of nuclear waste which we were generating. But through the focused pursuit of that issue by Mrs. Lloyd, that certainly has come to be a reality on the national level. And I learned a lot in that process from her.

We are now both involved in particularly trying to develop some clean coal demonstration uses, something that is very needed in this country, something that my district will appreciate very much, as I know will Tennessee. And it looks like we are being successful in that area, as well.

It is a great pleasure for me to come and join you particularly in your district because of that history that you and I have had together over those several years. It is also hard, I think, to think of a more appropriate location than Oak Ridge for our committees to look at this question of the transfer of technology into the private sector, or for the benefit of the private sector, that has developed

out of the massive Federal research effort that we have. The committees are very aware of the achievements of Oak Ridge National Laboratory over the years, and in fact in technology transfer Oak Ridge looms large, particularly within the Department of Energy. It is my understanding that Oak Ridge accounts for some 70 percent of the revenues that are attributable to technology that has been developed within the Federal research effort and transferred in one form or another to commercial use. Seventy percent of the Department of Energy's royalties and the like that come from that are attributable solely to the effort that has been developed at Oak Ridge. And when you think of the breadth of the National Laboratory effort, that is quite a testimony to something good that has happened in this facility.

This hearing will represent the third day of hearings that my particular subcommittee has had on the question of technology transfer this year. As a Science Policy Subcommittee, we have general jurisdiction over the policies of the Federal Government that attempt to encourage transfer and where the origin of the original Stevenson-Wydler Act and also the reform of the patent law that we had on the Federal level just last year. So we, as a committee, are very interested in trying to improve the incentives that lead to that kind of benefit to society.

We did last year extend contractor ownership of patents to nonprofit organizations but not to those run by forprofit organizations with respect to Government-operated, Government-owned contractor-operated laboratories. But the legislative history and our intent in that process was very clear, in which we specified that although we could not statutorily change the treatment of forprofit GOCO laboratory situations, we intended the Department of Energy to establish as uniform a patent policy for these kinds of laboratories as is permitted by the law. There is a very wide range of discretion in the Department of Energy to make the transfer incentives uniform across the board, regardless of whether it is a profit or a nonprofit entity that is operating such an entity.

We are looking very much forward to hearing from the Department of Energy to hear what progress they are making in following that mandate of the Congress, which is to incorporate the changes that we have made in the patent area and make them as applicable as possible to Government-owned and contractor-operated laboratories and particularly these.

So, in bringing the staff of the subcommittee and making a record here today, we really feel that we are embarked on important concerns. Knowing the almost, well, the very widespread impact on local economic development of advances in knowledge and the new technologies have a much broader impact on a regional economy than do just one particular entity or one particular work force, we feel that there is much progress to be made in this area. The Federal Government is making a massive investment and we want to make sure that that investment is driven toward the benefit of the public, region by region, as it possibly can. So, in bringing the staff and particularly in making the record we make today, we will take back to us to Washington an ability to examine and reflect on the comments that are made to the subcommittee in

this hearing process. And we are very hopeful that something good and constructive can come from that.

I appreciate the opportunity to be with you, Marylyn, and look forward to the testimony.

[The prepared opening statement of Representative Walgren follows:]

OPENING REMARKS OF CONGRESSMAN DOUG WALGREN: OAK RIDGE HEARING

It is a pleasure to join with my colleague, Congresswoman Lloyd in cosponsoring these hearings on technology transfer. Mrs. Lloyd over the past decade has been a tireless advocate for the Oak Ridge area in the Congress and she has made us well aware of the great things this area's unique group of scientists and engineers has to offer. Mrs. Lloyd is a highly regarded Member of Congress who has had more than her share of tough battles to fight. Through it all she has maintained the goodwill of Members of Congress from both parties. She has shown herself to be an effective legislator by her hard work in getting a comprehensive nuclear waste bill enacted, a feat many thought was impossible given the great divisions within the Congress and the multitude of committees involved in the process. More recently, it has been a pleasure to work with Mrs. Lloyd to achieve a balanced energy policy for our country through the clean coal initiatives we both strongly support.

It is also hard to think of a more appropriate location than Oak Ridge, Tennessee to continue our exploration of better ways to get technology out of the federal laboratories and into the marketplace. We are well aware of the tremendous achievements of the Oak Ridge National Laboratory over the years and of the superior manufacturing techniques employed at the Y-12 facility here in Oak Ridge. As one of the few world-class research operations that is also engaged in state of the art manufacturing, I am sure that Oak Ridge has a lot to teach the rest of us. Today, we will talk a about what legislative and procedural changes are needed to make this happen.

For my subcommittee, this is the third day of hearings this year on technology transfer. We have received testimony from a wide variety of witnesses on proposed legislation to extend authority to all government laboratories to enter cooperative agreements, to institutionalize the federal laboratory consortium, and to improve the system of rewarding inventors who work directly or indirectly for the federal government. We may mark up legislation in this area in the Fall.

My subcommittee also considered last year's reform of federal patent policy, which extended contractor ownership of patents to GOCOs operated by non-profit organizations, but *not* to those run by for-profit organizations. Our legislative history is clear that, while we could not get agreement on the specific statutory change which formally would have changed the patent policy of Martin Marietta Energy Systems, we intended DOE to establish as uniform a patent policy for GOCOs as is permitted by law. Therefore, as part of this hearing we hope to learn what progress is being made in the impremention of this policy in Oak Ridge and to determine what further legislative changes, if any might be necessary.

Therefore, I look forward to today's testimony on technology transfer and patent policy, and to sharing in the wealth of information on these topics that today's witnesses have accumulated.

Ms. LLOYD. Thank you very much.

I might add that I think it is worthy to note that Members of Congress do make a great deal of personal sacrifice to attend hearings such as this across the United States. So, for that reason, I am even more grateful for Congressman Walgren being here. He has twin babies that need a lot of support, as well, and also Congressman Morrison flew in on the redeye—I am certain many of you are familiar with that—from Washington State.

We do welcome our ranking Republican on our subcommittee. He is certainly a good friend of mine and I have worked very closely with him as well. Mr. Sid Morrison, we certainly welcome you and look forward to your statement.

Mr. MORRISON. Thank you very much.

If it is all right, Madam Chairman, since I think I feel like I am a part of the Oak Ridge family this morning, to put my formal statement in the record and let me just make a couple of comments.

Ms. LLOYD. Without objection.

[The prepared statement of Representative Morrison follows:]

OPENING STATEMENT OF THE HONORABLE SID MORRISON, DOE TECHNOLOGY TRANSFER AND PATENT POLICY: JOINT FIELD HEARING IN OAK RIDGE—JULY 15, 1985

Good Morning. Today, our two Subcommittees will continue our review of one of the most important legislative issues facing our Committee—the transfer of technology from our national laboratories to the private sector. I welcome all of the witnesses who have joined us this morning in Oak Ridge, and I also extend a special thanks to my Chairman, the Honorable Marilyn Lloyd, for acting as our warm host for this joint field hearing.

For too long we have watched our substantial Federal investment in research not be translated into tangible innovative developments in private industry. I have always marveled at the ingenuity, sophistication, and creativity of our national labs. These elite laboratories—particularly the Department of Energy labs—are the jewels of our Federal investment in science and technology. We must harness the outstanding talents and resources of these institutions for the good of the entire nation.

To achieve this objective, we must facilitate the transfer of technology from the DOE labs to private enterprise. We must, however, approach this problem realistically, without compromising the primary Federal R&D missions of the national labs. "Tech. Transfer" has become a sexy buzz phase which everyone seems to support. The time has come to translate this very popular concept into concrete action.

A major component of technology transfer has become patent policy. The National laboratories must have sufficient control of the patents for technology developments conceived in their labs. The Congress and the Administration have made substantial progress on this front. But besides providing for a waiver of government ownership of patents, we also must give the labs the resources they need to pursue the development and approval of patents. Other important topics include direct private sector interaction, royalties, and other incentives aimed at encouraging the transfer of innovations from the laboratory to industry.

I look forward to exploring all of these options today as we continue to lay the foundation for legislative action. Thank-you Madam Chairman and Chairman Walgren.

Mr. MORRISON. First of all, an appreciation to you for the hospitality that has been shown in meeting an early-morning flight not too far from here.

Just to comment in this subject area that, as a relative newcomer to this committee, I have always marveled at the ingenuity, the sophistication and the creativity of our national labs, and I am sure Oak Ridge is very much in the category of providing the innovation that America now calls for as more and more of our citizens talk about high tech and all of these things that have become popular buzz words.

I appreciate, too, as Congressman Walgren has indicated, the opportunity to visit Oak Ridge, the beauty of the area, the diversity of the programs that I understand to be here. And I have to, just on a personal note, mention that I was pleased to see a Reactor Room just down the street a little ways. It makes me feel almost at home, since I represent the Hanford area, and people may occasionally give us a bad time. While I wasn't here in time to go into the Reactor Room, I understand from my staff that a chain reaction is possible.

I have had the privilege of sitting in with Congressman Walgren on at least one of his previous subcommittee hearings on the sub-

ject of technology transfer. From that and from talking with a lot of people in the area I represent, I understand some of the difficulties that we have. I am eager today to learn more about the complications when you are dealing with a forprofit government contractor as opposed to the nonprofit, which is more familiar in my particular area.

I understand that substantial progress has been made in this whole area in previous sessions of Congress, and, very frankly, I look forward to being part of the committee. Speaking for the members of my side of the politican aisle, we want to join you in whatever can be done in speeding the way for technology transfer done as it should be done, in fairness to America's taxpayers. And so I look forward to the session that you have set up today.

Thank you very much.

Ms. LLOYD. Thank you very much. And at this point, I would like to ask unanimous consent of the subcommittee to permit today's hearings to be recorded and covered by the media as well as other persons.

Without objection, so ordered.

We are ready now to hear from our witnesses. And I would like to state for the record that their complete written statements will be made part of the official hearings. And we have asked our witnesses to summarize their remarks in their oral presentations today if they so desire.

Our first witnesses this morning are from the Department of Energy's headquarters in Washington. Ms. Antoinette Grayson Joseph is the Director, Office of Field Operations Management, and Mr. Richard Constant is Assistant General Counsel for Patents. We very much appreciate both of you making this trip to Oak Ridge today. We look forward to your testimony. Ms. Joseph, you may proceed at this time.

STATEMENT OF ANTOINETTE GRAYSON JOSEPH, DIRECTOR OF FIELD OPERATIONS MANAGEMENT, OFFICE OF ENERGY RESEARCH, DEPARTMENT OF ENERGY

Ms. JOSEPH. Thank you.

Madam Chair, Mr. Chairman, and Congressman Morrison, I am pleased to appear before you today to discuss the Department of Energy's technology transfer policies and to present my view of how these policies have affected DOE laboratory technology transfer programs.

The laboratories and technology centers of the Department of Energy are a major part of the U.S. technology base. Over the years, the technology generated in mission areas of the Department of Energy has been reapplied by industry for use in commercial products and processes. Nuclear power, nuclear medicine, radiation processing, ion implantation, materials science advances, fluidized bed combustion, and supercomputers are but a few of the extensive technology transfers that have come about as a result of research and development sponsored by the Department of Energy. Oak Ridge National Laboratory is a leader in this area.

We have encouraged the transfer of research and development from these institutions to the private sector. Our Government lab-

oratories are encouraged to support the broader effort to improve technology transfer to U.S. industry by identifying appropriate laboratory technology; identifying and informing interested firms or investors; and supporting, by making laboratory facilities and staff available to industry, those developmental efforts necessary to commercialize spinoff technology.

You will hear from Bill Carpenter in some detail about the recent success of Martin Marietta in these areas, including the new technology exchange research program initiatives funded by the Office of Energy Research. So I will not go into those at this point.

The Department of Energy R&D Laboratory Technology Transfer Program is managed by the Office of Energy Research and was implemented in response to the Stevenson-Wydler Technology Innovation Act. The program establishes the institutional policy and the framework for technology transfer to the domestic, public, and private sectors. Each laboratory has full flexibility to implement the activities in the most suitable fashion for its own mission and organizational circumstances.

The overall purpose of the technology transfer program, as you stated, is to facilitate improved utilization by State and local governments and the private sector of federally funded technology developments in order to strengthen the U.S. industrial base and our competitive position in the international marketplace.

The DOE policy is established by a Departmental Order which reflects the intent of the legislation that technology transfer be integrated into the operation of each R&D laboratory. The Secretary of Energy has said that a fundamental role of the laboratories is to provide the technology they develop to the public and private sectors and to facilitate cooperation between the national laboratories and industry. In order to improve on our technology transfer efforts, the Department continues to address potential improvements and policies relating to work for others, patent licensing, and incentives to technology transfer. The laboratories are encouraged to propose new initiatives to facilitate spinoff of technology developed at the laboratory to domestic industry and to improve the technology transfer process itself. Bill Carpenter will also report on some successful ORNL programs in this area, funded by the Office of Energy Research.

Each laboratory is required to establish an Office of Research and Technology Applications. Under John Foderstone, the ORTA at ORNL has enhanced the person-to-person interactions between laboratory researchers and potential public and private users of the technology which we believe are the key to the program's approach.

Consistent with the intent of Public Law 96-480, the Department publishes the Research and Development Laboratory Technology Transfer Program Annual Report. This publication, essentially a compilation of laboratory technology transfer reports to DOE, summarizes the highlights of technology transfer activity at the major Department laboratories. Recent examples of technical benefits of the energy programs range from the commercial development of thin-film photovoltaic cells to better technology for treating industrial and municipal waste.

The report lists technology applications, assessments, and technical information Energygrams by laboratory, and provides a listing of laboratory program contact personnel. I would like to provide our most recent copy for the record, along with a copy of the User's Guide to DOE facilities. These user facilities are an important mechanism for cooperative R&D and associated technology transfer at Oak Ridge National Laboratory and at our other major laboratories across the Nation.

Ms. LLOYD. Without objection, it will be included.

[The information follows:]

DOE/ER-0192/1

U.S. Department of Energy
Office of Energy Research
Director of Laboratory Management

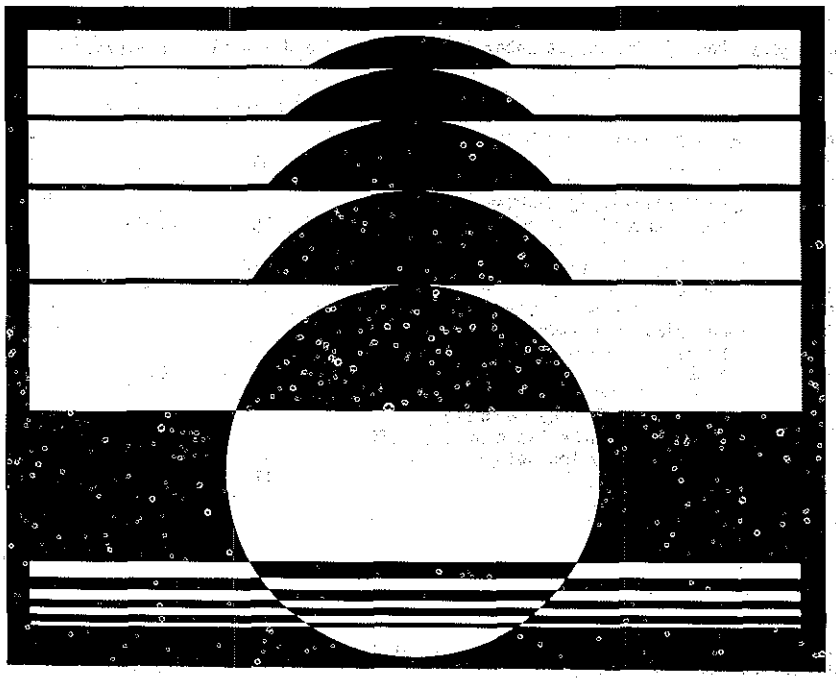
August 1985

Technology Transfer '84

Fiscal Year Annual Report

U.S. Department of Energy
Research & Development Laboratory
Technology Transfer Program

Complete Report on file in Subcommittee Offices



INSERT to TRANSCRIPT OF JULY 15 HEARING ON TECHNOLOGY TRANSFER AND PATENT POLICY
SPEAKER: MS. JOSEPH

Department of Energy (DOE) Multiprogram
National Laboratories
Technology Transfer Indicators

The estimated data below is for the nine DOE multiprogram national laboratories and should be considered preliminary.

The laboratories included in the survey are: Argonne National Laboratory, Brookhaven National Laboratory, Idaho National Engineering Laboratory, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, Pacific Northwest Laboratory, and Sandia National Laboratories.

	FY 1982	FY 1985
Joint Projects Number	50	125
User Facilities Companies Represented*	70	100
Technology Transfer Workshops Number	55	105
Industrial Consulting by Laboratory Staff Number	540	810
Companies Started by Laboratory Personnel and/or Based on Spin-off of Laboratory Technology Number	11	23

*A copy of trends on visitors from 1981 to 1985 at user facilities from Brookhaven National Laboratory is also enclosed as a specific example for your information.

VII. EXTERNAL INTERACTIONS

LABORATORY COLLABORATIVE RESEARCH CENTERS

User Facilities

	1981	1982	1983	1984	1985
Alternating Gradient Synchrotron					
Number of Users	157	245	309	324	335
BNL	50	72	77	47	76
Visitors	107	173	232	277	259
% Use					
BNL	31	29	25	15	23
Visitors	69	71	75	85	77
Total Operating Costs ($M)	25.5	24.2	30.4	34.1	36.1
Tandem Van de Graaff					
Number of Users	116	133	109	115	55
BNL	22	22	20	18	11
Visitors	94	111	89	97	44
% Use					
BNL	56	55	49	43	25
Visitors	44	45	51	57	75
Total Operating Costs ($M)	1.7	1.8	1.5	1.5	1.5
High Flux Beam Reactor					
Number of Users	211	203	202	240	235
BNL	44	42	35	34	35
Visitors	167	161	167	206	200
% Use					
BNL	42	43	48	45	42
Visitors	58	57	52	55	58
Total Operating Costs ($M)	4.1	4.7	5.8	6.5	8.0
National Synchrotron Light Source					
Number of Users	---	57	90	137	300
BNL	---	16	21	35	50
Visitors	---	41	69	102	250
% Use					
BNL	---	28	23	26	25
Visitors	---	72	77	74	75
Total Operating Costs ($M)	---	7.4	9.7	11.9	14.45

Scanning Transmission Electron Microscope	1981	1982	1983	1984	1985
Number of Users	24	24	26	42	46
BNL	5	4	6	8	8
Visitors	19	20	20	34	34
% Use					
BNL	35	43	38	40	40
Visitors	65	57	62	60	60
Total Operating Costs ($M)	0.4	0.4	0.4	0.4	0.5

Ms. JOSEPH. Thank you.

Technology transfer is difficult at best, as many people with experience both from the industrial and laboratory sectors have noted. Roland Schmitt, who is senior vice president of corporate R&D at General Electric, has made the point that technology transfer is really a misnomer; it is really technology teamwork between R&D organizations and it needs to start early on and continue long after the first innovation. From the first year's experience with Martin Marietta, I think they understand this concept totally.

Given recent policy incentives from headquarters, there is growing movement in our laboratories toward increased interaction with industry and universities in the transfer of our technology to the domestic economy. The Department will continue to support innovative technology transfer programs and to encourage our laboratories to stimulate the invention, patenting, and transferring of unclassified new technology. Therefore, I believe this positive trend will continue.

I would be pleased to try to answer any questions you may have.

[The prepared statement of Ms. Joseph follows:]

PREPARED STATEMENT OF ANTOINETTE GRAYSON JOSEPH

Introduction

Mr. Chairman and members of the Subcommittee, I am pleased to appear before you today to discuss the Department of Energy's (DOE) technology transfer policies and to present my view of how these policies have affected DOE laboratory technology transfer programs.

Department of Energy Efforts

The laboratories and technology centers of the Department of Energy are a major part of the U.S. technology base. Over the years, the technology generated in mission areas of the Department of Energy has been reapplied by industry for use in commercial products and processes. Nuclear power, nuclear medicine, radiation processing, ion implantation, materials advances, fluidized bed coal combustion, and supercomputers are but a few of the extensive technology transfers that have come about as a result of research and development sponsored by the Department.

We have encouraged the transfer of research and development from these institutions to the private sector. The researchers in our laboratories have a natural motivation to see their discoveries utilized for the national good. The key to our technology transfer policy and program is person-to-person interactions between our laboratory researchers and industry counterparts. Success also lies in American industry's motivation to obtain Government-developed technology from the laboratories. The Department has established technology transfer as a

vitally important secondary role of the laboratories which should be implemented so as to reinforce the primary laboratory research and development missions.

Our Government laboratories are encouraged to support the broader effort to improve technology transfer to U.S. industry by:

- o identifying appropriate laboratory technology;
- o identifying and informing interested firms or investors; and
- o supporting, by making laboratory facilities and staff available to industry, developmental efforts to commercialize spin-off technology.

The DOE R&D Laboratory Technology Transfer Program, managed by the Office of Energy Research, was implemented in response to the Stevenson-Wydler Technology Innovation Act (P.L. 96-480). The program establishes the institutional policy and framework for technology transfer to the domestic public and private sectors. Each laboratory has full flexibility to implement the activities in the most suitable fashion for its own mission and organizational circumstances.

The overall purpose of the technology transfer program is to facilitate improved utilization by State and local governments and the private sector of federally-funded technology developments in order to strengthen the United States industrial base and competitive position in the international marketplace.

The DOE policy is established by a Departmental Order which reflects the intent of the legislation that technology transfer be integrated into the operations of each R&D laboratory. The Order, DOE 5800.1 (Research and Development Laboratory Technology Transfer Program), states: "It is DOE policy that technology transfer activities as required by Public Law 96-480 are legitimate functions of the R&D laboratories and will be conducted, as appropriate, at those laboratories specified in this Order." The Order details the objectives of the program, the responsibilities and authorities of relevant Departmental elements, and requires a technology transfer report each year from participating laboratories to communicate achievements and identify issues.

The Secretary of Energy has said that a fundamental role of the laboratories is to provide the technology they developed to the public and private sectors and facilitate cooperation between the national laboratories and industry. Providing technology transfer does not imply a change in the primary program mission nature of the laboratories but complements their technology development programs and facilitates use of the product of these programs by their spin-off to our national industrial base.

In order to advance the DOE technology transfer program, the Department and the laboratories must seek means of improving the transfer of technology from Government-sponsored R&D programs.

Therefore, the Department continues to address improvements in policies relating to work for others, patent licensing, and incentives to technology transfer. The laboratories are encouraged to propose new initiatives to facilitate spin-off of technology developed at the laboratory to domestic industry and to improve the technology transfer process itself.

Offices of Research and Technology Applications

Each laboratory is required to establish an Office of Research and Technology Applications (ORTA). In laboratories with budgets over $20 million/year, the ORTA is staffed by a full-time professional. Small laboratories may add the ORTA function to an existing position. In any event, the person-to-person interactions between laboratory researchers and potential public and private users of the technology are the key to the program's approach. In general, the ORTA:

- Provides a central coordination point in the laboratory for technology transfer;
- Provides support to technology transfer activities of the laboratory's scientific departments;
- Identifies opportunities to improve the technology transfer process and to encourage spin-off of technology developed at the laboratory;
- Facilitates one-on-one interaction between laboratory scientific personnel and technology recipients;

- o Disseminates information on laboratory technology having potential application in private industry or State and local governments;
- o Ensures that Application Assessment Records are prepared for research projects with potential for application in State or local governments, or private industry;
- o Cooperates with Government information clearinghouses that link the laboratory, the Federal Government, and potential users in State and local governments and private industry;
- o Provides technical assistance in response to requests from State and local government officials; and
- o Prepares Laboratory Technology Transfer Annual Report.

Application Assessment Records

The Application Assessment Records provide a standardized format for reporting information about laboratory R&D with potential for application in other sectors and meet the legislation requirement that laboratories report on technologies which they identify as having potential for application in private industry or State and local governments. The ORTA sends completed Application Assessments to the DOE Office of Scientific and Technical Information. That office incorporates the information in DOE data bases, publishes it in the DOE Energygram series, and transmits it to the National Technical Information Service for further dissemination.

DOE R&D Laboratory Technology Transfer Program Annual Report

Consistent with the intent of P.L. 96-480, the Department publishes the Research and Development Laboratory Technology Transfer Program Annual Report. This publication, essentially a compilation of laboratory technology transfer reports to DOE, summarizes the highlights of technology transfer activity at the major Department laboratories, lists technology application assessments and technical information Energygrams by laboratory, and provides a listing of laboratory program contact personnel.

Conclusion

Technology transfer is difficult at best, as many people with experience both from the industrial and laboratory sectors have noted. Roland Schmitt, Senior Vice President, Corporate Research and Development, General Electric Company, has made the point that "technology transfer" is a misnomer--it is really "technology teamwork" between R&D organizations and it needs to start early on and continue long after the first innovation. Abdus Salam, Director of the International Center for Theoretical Physics in Trieste, has emphasized the importance of "science transfer." These statements emphasize person-to-person interactions between laboratory scientists and their industry counterparts. Our policies emphasize the same person-to-person interactions.

Given recent policy incentives from Headquarters, there is growing movement in our laboratories toward increased interaction with industry and universities in the transfer of our technology to the domestic

economy. The Department will continue to support innovative technology transfer programs and encourage our laboratories to stimulate the invention, patenting, and transferring of unclassified new technology. Therefore, I believe this positive trend will continue.

I would be pleased to answer any questions you may have.

Ms. LLOYD. Thank you very much, Ms. Joseph.

Mr. Constant, you may proceed with your statement, and your complete remarks will be made a part of the record, so you may summarize as you wish.

STATEMENT OF RICHARD E. CONSTANT, ASSISTANT GENERAL COUNSEL FOR PATENTS, DEPARTMENT OF ENERGY

Mr. CONSTANT. Thank you. Madam Chair, Mr. Chairman, Congressman Morrison, I will present my prepared statement first and then Ms. Joseph and I will be available to answer any questions.

In order to use the patent system to promote utilization of inventions arising from federally supported research or development, Public Law 96-517, enacted in 1980, provided that nonprofit organizations or small businesses may elect to retain title to subject inventions made under funding agreements with the Government. However, the law provided exemptions to this approach for funding agreements for the operation of Government-owned research or production facilities, referred to as GOCO's, or in exceptional circumstances when it is determined that restriction or elimination of the right to retain title will better promote the policy and objectives of the act.

Public Law 98-620, enacted in late 1984, amended Public Law 96-517 by modifying the exemption for GOCO facilities. It limits the exemption to DOE facilities primarily dedicated to naval nuclear propulsion or weapons related activities, and then further limits the exemption to inventions occurring under these specific programs at those facilities. The exemption for exceptional circumstances remains in the amended act.

Under the provisions of Public Law 98-620, to be implemented by regulations being written by the Department of Commerce, GOCO facility operators which are nonprofit organizations or small businesses will be permitted to retain ownership of inventions made by personnel of the facilities they manage and operate, unless the contract or invention in question falls within one of the exemptions provided in the statute.

The exemptions described above are enumerated in section 202(a) of the law and include cases in which a determination of exceptional circumstances has been made. The Department has made exceptional circumstances determinations for uranium enrichment, for civilian radioactive waste and spent fuel storage and disposal, and for all classified subject matter and unclassified but sensitive subject matter. In accordance with the provisions of the law, exceptions will also be made for work covered by international agreements.

The regulations being written by the Commerce Department are expected to cover DOE's use of the exemptions for GOCO facilities primarily dedicated to the weapons related and naval nuclear propulsion programs of DOE. According to the draft regulations made available to DOE, nonprofit and small business operators of such facilities would be permitted to retain ownership of inventions made at these facilities occurring outside the weapons and naval nuclear propulsion programs. Inventions occurring in these programs would be owned by the Government. However, the facility

operator could request waivers for these latter inventions on a case-by-case basis, consistent with current policy. Rights to inventions for for-profit contractors are still determined by the provisions of section 152 of the Atomic Energy Act of 1954 and by section 9 of the Federal Nonnuclear Research and Development Act of 1974. Under these provisions, title to inventions arising under contracts with for-profit contractors vests with the Government unless waived. The Department policy is to allow contractors to retain title to inventions to the maximum extent possible, consistent with the President's memorandum on patent policy, applicable statutory authority and mission requirements.

The Department intends to pursue a series of class waivers covering different contractual situations. These class waivers will permit the for-profit contractor to elect to retain rights to inventions arising under its contract in which the contractor has a commercial interest. The contractor, in order to qualify for the waiver, will have to exhibit a serious intention to develop the invention to the point of practical application either by the contractor or by its licensee. Exceptions to these waivers will fall into the areas of exceptional circumstances, weapons-related and naval nuclear propulsion technologies and work covered by international agreements.

As an example of the Department's activities in licensing and waivers over the last few years, I have put together, from a cursory review of our files, a few statistics that may be of interest. The Department has granted 47 nonexclusive patent licenses and 19 exclusive patent licenses in the last 4 years. The Department has also waived 220 identified inventions in the same period to its contractors for use in their commercialization efforts. Also, in the last 4 years, the Department has waived at the time of contracting all inventions arising under 110 contracts to encourage commercialization of contract efforts by the contractor. In other words, for the fiscal years 1981 to 1984 the Department retained title to a total of about 1,400 U.S. patent applications filed on its behalf and waived rights to its contractors to at least 600 U.S. patent applications filed on their behalf. That means that about one out of every three inventions arising under DOE contracts, in which the Government normally would have retained title to the inventions and which have resulted in filing of patent applications, have been waived to the contractor. These numbers do not take into account patent applications filed by small business and nonprofit contractors who retained rights under Public Law 96-517. Also, the patent rights to which DOE retained ownership are available to the public for licensing under the authority of 35 U.S.C. 207.

If I can answer any questions related to these matters, I would be pleased to do so.

[The prepared statement of Mr. Constant follows:]

PREPARED STATEMENT OF RICHARD E. CONSTANT

In order to use the patent system to promote utilization of inventions arising from federally supported research or development, Pub. L. 96-517, enacted in 1980, provides that nonprofit organizations or small businesses may elect to retain title to subject inventions made under funding agreements with the Government. However, the law provides exemptions to this approach for funding agreements for the operation of Government-owned research or production facilities (GOCO's) or in "exceptional circumstances" when it is determined that restriction or elimination of the right to retain title will better promote the policy and objectives of the Act.

Public Law 98-620, enacted in late 1984, amended Pub. L. 96-517 by modifying the exemption for "GOCO" facilities. It limits the exemption to DOE facilities primarily dedicated to naval nuclear propulsion or weapons related activities, and then further limits the exemption to inventions occurring under specific programs at those facilities. The exemption for "exceptional circumstances" remains in the amended Act.

Under the provisions of Public Law 98-620, to be implemented by regulations being written by the Department of Commerce, "GOCO" facility operators which are nonprofit organizations or small businesses will be permitted to retain ownership of inventions made by personnel of the facilities they manage and

operate, unless the contract or invention in question falls within one of the exemptions provided in the statute.

The exemptions described above are enumerated in section 202(a) of the law and include cases in which a determination of exceptional circumstances has been made. The Department has made "exceptional circumstances" determinations for uranium enrichment, for civilian radioactive waste and spent fuel storage and disposal, and for all classified subject matter and unclassified but sensitive subject matter. In accordance with provisions of the law, exceptions will also be made for work covered by international agreements.

The regulations being written by the Commerce Department are expected to cover DOE's use of the exemption for "GOCO" facilities primarily dedicated to the weapons related and naval nuclear propulsion programs of DOE. According to the draft regulations made available to DOE, nonprofit and small business operators of such facilities would be permitted to retain ownership of inventions made at these facilities occurring outside the weapons and naval nuclear propulsion programs. Inventions occurring in these programs would be owned by the Government. However, the facility operator could request waivers for these latter inventions on a case-by-case basis, consistent with current policy.

The Department intends to pursue a series of class waivers covering different contractual situations. These class waivers will permit the contractor to elect to retain rights to inventions arising under its contract in which the contractor has a commercial interest. The contractor, in order to qualify for the waiver, will have to exhibit a serious intention to develop the invention to the point of practical application either by the contractor or by its licensee. Exceptions to these waivers will fall into the areas of exceptional circumstances, weapons-related and naval nuclear propulsion technologies and work covered by international agreements.

As an example of the Department's activities in licensing and waivers over the last few years, I have put together, from a cursory review of our files, a few statistics that may be of interest. The Department has granted 47 nonexclusive patent licenses and 19 exclusive patent licenses in the last 4 years. The Department has also waived 220 identified inventions in the same period to its contractors for use in their commercialization efforts. Also, in the last 4 years, the Department has waived at the time of contracting all inventions arising under 110 contracts to encourage commercialization of contract efforts by the contractor. In other words, for fiscal years 1981-1984 the Department retained title to a total of 1,399 U.S. patent applications filed on its behalf and waived rights to its contractors to at least 605 U.S. patent applications filed on

their behalf. These numbers do not take into account patent applications filed by small business and nonprofit contractors who retained rights under 35 U.S.C. 202. The patent rights to which DOE retained ownership are available to the public for licensing under the authority of 35 U.S.C. 207.

If I can answer any questions related to these matters, I would be pleased to do so.

Ms. LLOYD. Thank you very much, Mr. Constant.

You both gave very enlightening testimony.

Ms. Joseph, you stated in your conclusion that technology transfer is difficult, at best. What has been the total dollar investment by the Department to meet the requirements of the Stevenson-Wydler Act in our technology-transfer-related activities at the laboratory? Do you have a figure that you could use?

Ms. JOSEPH. What we have done is ensured that the requirement in the Stevenson-Wydler Act, one-half of 1 percent on technology transfer, is indeed clearly expended on those kinds of activities, which, to be honest, a total dollar level that looks very accurate would be hard to come by. The way the Department of Energy operates in technology transfer in the program responsibility at, say, the Fusion Program Level, or the Fission Program Level, and there are dollars that are spent as a natural program development expenditure that would have to be taken out of the program dollars to calculate—quote—technology-transfer true expense. We haven't tried to do that because those things that are clearly technology transfer do go far beyond the one-half of 1 percent expenditure requirement.

Ms. LLOYD. I didn't really feel like you could give me a dollar estimate, but I was looking for some general figure.

What efforts have been made to really determine the economic benefits from the technology transfer from the national laboratories?

Ms. JOSEPH. One of the efforts that is underway is to put a panel together, some people from the National Academy of Sciences, to look at this question based on the questions we get at congressional hearings on the appropriations, because of the difficulty of explaining how basic research, for example, is something that can be translated into a product that the private sector ultimately benefits from. The examples that we have from the early days of the Atomic Energy Commission are obvious. Nuclear power came from the early basic research. In the early days of the Atomic Energy Commission, the whole nuclear medicine application field, which someone estimates is over $8 billion now as a commercial enterprise, came out of that nuclear research. Those kinds of things are being looked at in this study to determine whether or not you can put that kind of conclusion on tech transfer from these research efforts. The problem, of course, is that there is a lot of other interaction before it actually becomes a product. And the difference between the applied part of it and the actual part of the process that the private sector does is the part that is hard to calculate. What we'll be showing is the impact of basic research on the final product in the marketplace.

Ms. LLOYD. You build on your base as you progress in development of the technology——

Ms. JOSEPH. It's really——

Ms. LLOYD [continuing]. Certainly can't really quantify it to that degree.

The other DOE agencies, for example, the Office of Nuclear Energy Programs, support the technology-transfer programs. How well do you work with the other offices in coordinating activities?

Ms. JOSEPH. In coordinating activities with the other offices, very well. I think the special aspect of the Department of Energy is the integration of these programs that can take place in the laboratory. You have a laboratory like Oak Ridge National Laboratory that serves all the program activities of the Department of Energy, and has a central activity related to technology transfer that promotes transfer of the result from all of those programs to the marketplace. And so we work with the program planners at headquarters and we work with implementors at the laboratories.

Ms. LLOYD. Well, you really led me into the final question I want to ask you: What progress is being made to really coordinate and implement the programs here at the Oak Ridge National Laboratory in technology transfer? Are we moving in that direction since so much is done here in Oak Ridge?

Ms. JOSEPH. I think that the progress in tech transfer has been accelerated with the change of contractor to Martin Marietta. I think Martin Marietta as exemplified in the contract itself has a very strong commitment to tech transfer, and it is part of the determination of the management fee that will go to Martin Marietta in terms of their success in the technology transfer. So you have a double incentive at Oak Ridge that doesn't exist at all of the other laboratories. And I think that it is already reflected in the results ranging from the number of IR 100 awards that Oak Ridge National Laboratory has won, to the numbers of patents that they have identified that they are interested in commercially.

Ms. LLOYD. Ms. Joseph, do you think some of the bills that have been introduced this year, if they should happen to become law—there are some variations but basically they have one major thrust—do you think this would help to implement technology transfer and profit GOCO's, such as Oak Ridge?

Ms. JOSEPH. My personal opinion is that additional legislation is not required. I think that statutory opportunities are there and it is now a matter of implementing those in a fulsome way and speeding up some of the processes that exist.

Ms. LLOYD. In other words, you think that right now we need to be busy complying with the laws that we have instead of trying to formulate new laws?

Ms. JOSEPH. And as a bureaucrat, I appreciate some of the flexibility we can give the laboratories to tailor implementation to their own circumstances as compared to additional laws that might be very good at spelling out broadly what should be done, but it gets into too much detail at the implementation part that actually——

Ms. LLOYD. It really stifles innovation, in Congress.

Ms. JOSEPH. Exactly.

Ms. LLOYD. Thank you very much.

Mr. Constant, in looking over your statement, on page 2, you are talking about the exemptions enumerated in section 202(a) of the law. It includes cases in which a determination of exceptional circumstances has been made. Would you interpret this to mean that we could consider it exceptional circumstances to really study and make an evaluation of the transfer of technology such as the spinoffs in our AGC Program here?

Mr. CONSTANT. The exceptional circumstances described is for uranium enrichment and would be broad enough to cover the gas

centrifuge. We do—which would except them from retaining rights under any class waiver that we would propose. However, any inventions that come under any exceptional circumstance are available to contractors through our normal waiver process for them to retain rights. And under our proposed class waiver, they will be enabled to request rights for fields of use that are outside of uranium enrichment under the class waiver.

Ms. LLOYD. For instance, through the spinoff of such technologies as biomedical research or SDI Programs?

Mr. CONSTANT. Yes. They would be able to qualify under the class waiver to receive rights for those types of activities that are outside of uranium enrichment itself.

Ms. LLOYD. Very good.

It has been about a year and a half now since the Department of Energy began to negotiate class waivers with Martin Marietta energy systems. I was wondering if you could give us the status of these negotiations, Mr. Constant?

Mr. CONSTANT. Probably. It is unfortunate that it has taken us this long. It is a matter—a lot of it can be laid probably to the circumstances and timing. The advance, Martin Marietta originally asked for an advance waiver under our authorities of section 9 of the Federal Non-Nuclear Research and Development Act and under section 152 of the Atomic Energy Act. We are progressing well along on that. When the Public Law 98-620 was passed in the fall, when that law was passed, the Department, in order to maintain uniformity in its patent policy, initiated an internal review of its patent policy to assure that such uniformity continued under the new situation. That work was completed in February and, since then, we have been awaiting the Commerce regulations on how they want us to implement the existing legislation so that we can incorporate that into our policy and provide uniformity in how we approach Martin Marietta in our class waivers.

Ms. LLOYD. The Department of Commerce has not issued their regulations at this time, but if they should issue their regulations within 1 month and if Martin Marietta negotiates in good faith, how long do you think it would take before the Oak Ridge class waivers could take effect?

Mr. CONSTANT. The class waivers themselves are under review within the Department now. We're not waiting for the regulations to come out to continue our review. I would expect that within several months at the most, after the issuance of the Commerce regs, we should be able to go forward with the request waivers, ensuring that uniformity continues.

Ms. LLOYD. What do you think is the toughest outstanding issue right now?

Mr. CONSTANT. The toughest, there are a series of toughest. The toughest issue, I suppose, in many respects would be agency and possibly with the program people. And Mrs. Joseph could probably respond to that. Maybe in the area of the unknowns as to the possible liabilities that the Government may be subjected to by its contractors entering into licensing agreements. Since, under our GOCO system, the Government absorbs all the costs that the contractor may incur, including most liability costs, it is possible that we may be subjected to those liability costs under these licensing

activities, and the Agency has to deal with that issue and how to approach that.

Ms. LLOYD. That is certainly a major current consideration.

One final question for you, Mr. Constant. Congressman Fuqua, in his Congressional Record explanation of the GOCO provisions in last year's patent bill stated as follows, I would like to read it: While those laboratories such as Oak Ridge National Laboratory, which are run for the Government by large companies are not formally covered by this section, it is hoped that the Department of Energy, using Federal Non-Nuclear Act authority will develop a standard patent policy consistent with this title for all its GOCO facilities.

I just wanted to ask you what problems, if any, do you see in extending this provision to Martin Marietta Energy Systems.

Mr. CONSTANT. The problems are more into the area of the implementation than to the—we have the same problems with Martin Marietta as we have with our nonprofit GOCO's in the areas of conflicts of interest and in assuring that there are not conflicts of interest arising from such activities, maintaining some control over the costs that might be—the Government may incur not only liability costs, but also consideration of patenting and licensing costs, and also assuring that the commercial activities do not impact on the ability of the Agency to continue carrying out its mission responsibilities and ensuring the free flow of information from one lab to another.

Most of our GOCO's in performing their work cooperate with other GOCO's in performing the same mission type of activities.

Ms. LLOYD. But isn't that true that Oak Ridge has the same—I mean, that works both ways. Oak Ridge works with other laboratories——

Mr. CONSTANT. Yes.

Ms. LLOYD [continuing]. That are nonprofit.

Thank you very much.

Would you like to comment further on that, Ms. Joseph?

Ms. JOSEPH. No, I agree. From a program standpoint those are the issues, and the conflict of interest one is one that is either industrial or the not for profits, that the Department has to take into consideration, how it ensures that with laboratories that are a very important part of our program planning, as well as the implementation, how to ensure that conflict of interest as it relates to the patents doesn't impinge on the kind of advice that we get and take.

Ms. LLOYD. Thank you.

Mr. Morrison?

Mr. MORRISON. Mr. Constant, you mentioned the regulations the Department of Commerce is working on. Do you have any idea on the timing on when those can be finalized?

Mr. CONSTANT. No, I don't.

Originally, they were hoping to get them out out in the early part of July. The last I spoke to them, which is about a week ago, they couldn't give me any estimate of the date.

Mr. MORRISON. So, they are making progress?

Mr. CONSTANT. Yes, they are. They are reviewing the comments that our Agency, as well as other agencies and the public have pro-

vided and looking at what revisions they should make in the original proposed draft.

Mr. MORRISON. Rather than a number of detailed questions for either or both of you, I guess as I begin to understand some of the difficulties associated with technology transfer, I get the impression that even once all systems, when all systems are go, there is no question as far as proceeding with a good idea and developing it for applications somewhere, that the time, the expense and the difficulty of getting the patent plus the even greater difficulty then of making the huge step up into actual "here it is, world, bring your money"—what seems to be the best technique, in your eyes, to squeeze this technology on up into the sector where someone else will provide the financing, at a very low rate, as I understand, of good ideas that actually are latched onto by someone to the point of developing them and making them available?

Mr. CONSTANT. In terms of patenting, the percentages are quite low. In terms of inventions that are patented that actually reach the commercial market and the real income that is received from it is quite low, as I understand it from most studies that are made on the subject.

Mr. MORRISON. Is this because the ideas are not that good or just that they have not been presented properly?

Mr. CONSTANT. It is not that. It may be that there is already something on the market that does it just as well or is not as expensive, or maybe it is not quite as good, but the new one may cost too much money to get it on the market. It is a very complex subject to get from invention to commercialization. I know, reading some testimony recently made by—I think it was Battelle Northwest Laboratories, they indicated that it takes some 7 years to get from the point of invention to the point where they are receiving income, on an average, on most of their inventions. Of the ideas which they are studying—I believe the numbers, they said something like, out of 20,000 ideas, they obtained maybe 20 that they thought were, that actually were really used.

Mr. MORRISON. They had the advantage of the first one with Xerox——

Mr. CONSTANT. That's right.

Mr. MORRISON [continuing]. Which was nice.

Ms. JOSEPH. One of the things there seems to be a consensus on, in other words there is no single formula. The person-to-person interactions, particularly with the laboratory people with the private sector counterparts are the most important ingredient in the process itself, and that what you need then is a real entrepreneur, sometimes in the laboratory, sometimes from the outside; and the spinoff companies that come from the laboratory—and Oak Ridge is a good example of those kinds of transfer—have the greatest success of the working. People then transfer with their ideas and continue to promote it. But there is no baton passing, as in a relay race. It's not nice and clean. I have this idea and all someone has to do is grab the baton and take it on to commercialization.

Mr. MORRISON. I guess what I worry about is that, as in so many elements of Government, I see interference in this baton passing, if you will. Admittedly, there is no clean break. It would be ideal if we had someone probably like you making the decisions. But we

worry about that. I think that is why Congress has a tendency to even meddle in some areas, just to make sure that there are some clean lines, if possible. And I would trust, as a result of these hearings, we don't do anything wrong.

Ms. LLOYD. Well, that's certainly our mission.

Ms. JOSEPH. I think the hearings have really facilitated attention within the Department to this activity. And even though I can truthfully say this has always been the DOE's responsibility, the spotlight shining on this area, people's report cards getting graded specifically on how well they are doing has really acted in terms of increasing the results in this area. I do not say that for all the areas where Congress has inspired us to do more on something we think we are already doing. But in the area of technology transfer, I think institutionalizing the process and bringing it up to high-level attention under Stevenson-Wydler has significantly aided the bureaucracy in being able to continue to push in this direction.

Mr. MORRISON. We probably will want to do some pulling, too. Thank you.

Ms. LLOYD. I think it is worthy of thought. Thank you very much.

Mr. Walgren?

Mr. WALGREN. Thank you, Mrs. Lloyd.

Even though, Ms. Joseph, we say you feel that there is significant increase in delivery in this area, we really have no measure of that, do we?

Ms. JOSEPH. We do, but it is mostly anecdotal data. We do not have a final line that says: there are these many products, there are these many dollars invested, and here is the benefit based on the cost invested. The anecdotal data based on reports from the laboratories and implementing technology transfers, the kind of forums where the laboratories now participate, which judge technology innovation ideas, like the IR 100 Magazine Awards, the very fact that the numbers of awards that the laboratories have been winning over the past few years in an area where you are looking at all R&D across the country, including the industrial laboratories, that the national laboratories' percentage, their total number of awards in this category is going up consistently, whereas I think this year—last year it was 17 awards to the laboratories, this year we're up to 20 awards. And probably the single——

Mr. WALGREN. Out of how many?

Ms. JOSEPH. Out of a 100. IR 100 is—the 100 awards for the 100 best technical ideas that they believe, based on peer evaluation, will make it into the marketplace. Oak Ridge, I think, is the leading laboratory in our system in this area, but has only been actually winning those awards in the past 4 or 5 years.

Mr. WALGREN. How many did Oak Ridge win?

Ms. JOSEPH. Four or five last year, which was one of the highest percentages of any single winner in the process.

Mr. WALGREN. Of course, there are variables in that. And I guess my wish is that we have more than anecdotal evidence or we're taking some kind of steps to see what does work, because what I hear in this area is that the first effort was to have an office for technology transfer in the individual laboratories. Then as we grapple with the real world, which is never what we want it to be, we

want to do more. And now everybody is saying, well, you have to have this interaction, this team work between the private sector and those actually working in the Government laboratories. And that may be, but I would think that that would be something that we could measure.

Are there steps within the Department of Energy to make an accurate quantitative measure of the increase in hours spent together, if that's——

Ms. JOSEPH. The number of meetings that are held to promote technology transfer, are recorded in the book as well, and we can trace those over time, and they are increasing significantly.

Mr. WALGREN. All right. But I gather they are talking about something other than meetings and symposia, but actual working together in a laboratory so that they spend their informal time together and the like. Is there any measure that you could devise that might tell us whether the laboratories are doing more or less of that sort of contacting?

Ms. JOSEPH. The policy is to promote that the Department of Energy promotes more joint projects between industry and laboratory.

Mr. WALGREN. How are you going to tell whether the policy is implemented and the degree to which the policy is picked up?

Ms. JOSEPH. This is one of, I think, the hardest areas that we have been pushing as well, because it is very difficult to tell a program person that, in addition to your understanding how best to implement your program, I want to ensure that you have this aspect involved. The program may say, the way I take care of that aspect, that objective, is through an industrial advisory committee that meets once a month to review the program plans, the R&D objectives, or criteria, et cetera. Therefore, in our area, what we are doing is trying to ensure that the objective is kept up front, but not to dictate that there has to be a certain percentage of joint industry laboratory research projects or that there has to be a certain number of symposia in a given area or a number of industrial people on all advisory committees. But we do look at those numbers. There is an increase. We do that internally for the Secretary, and through what we would call seed money type funding, we have promoted that.

One of the programs that I run is the University Research Support Program and, under that, I run the Laboratory Cooperative Program. In that category, we also have a recently funded initiative which Senator Domenici has promoted, which is an industrial fellowship program, and that a high-level industry person, maybe two or three for each laboratory, when we get the funding up to reasonable levels, will specifically spend, say, a year to two years, or maybe shorter periods, back and forth during that time, at a laboratory working on a joint project with a technology transfer component to that project.

Mr. WALGREN. What is the history of that funding in that particular program?

Ms. JOSEPH. We have $600,000 for this current year, and we are about to announce over a dozen appointments to the laboratories.

Mr. WALGREN. So, you can get 12 appointments this year. How many did you have last year?

Ms. JOSEPH. It was the first year.

Mr. WALGREN. So this is the first year of the seed money program?

Ms. JOSEPH. This is the first year of the separate seed money program. Last year, I am not sure how many joint appointments there were, but they would be in the hundreds across the board.

Mr. WALGREN. Can you find that out and submit it?

Ms. JOSEPH. We can, with some difficulty.

Mr. WALGREN. Because the problem that we have, who only see this briefly several days a year, is that it is very hard to see the additional effort that is being made. The answer that comes back is, well, we are implementing the Stevenson-Wydler Act by doing just what we always did, which is to not have an identified person but publish the same kinds of things that we were publishing before. That is one of the ways that is cited in the act to promote technology transfer. So, the laboratories came back and said, "We are doing it just like we did before." And it is very hard to see a new effort being made. And given the difficulties of turf and the like in a bureaucracy, it is very easy to see that somebody will continue to do what they have always done in that area and that we won't get anything new, we won't get any new push out of it.

To say, as we have now, after 5 years of experience with the Congress wanting to see something new happen under Stevenson-Wydler, that essentially we cannot account for any effort because it was always subsumed under what the expenditures were anyway, I think, is something that we ought to recognize is not an adequate measure of our effort under this act; and we ought to be looking for ways to document what is happening.

Ms. JOSEPH. I do not want to give you the wrong impression. There are areas that are easy to document, which we have documented, and which do show substantial progress. And in the areas where we are continuing to do what we have done, in those areas that are significant accomplishments and unique to the Department of Energy, we have continued the user facility activity of the Department, is a significant technology transfer contribution. And——

Mr. WALGREN. Can you measure that in terms of man-hours and value of access? And then can you go back and do a history of that so that we can see whether there is additional effort being given in this area, or are we just doing what you did not need to be told to do?

Ms. JOSEPH. We can show that there is additional effort and there are new facilities like the National Light Source at Brookhaven National Laboratory, where participation by industry is 40 percent of the participation.

[The information follows:]

INSERT FOR THE RECORD

List of DOE-owned patents that have been exclusively licensed since inception of the Department of Energy.

Invention	Licensee
U.S. Patent No. 3,624,772 "Reading and Writing Machine Using Raised Patterns"	Research for Braille Communication Chicago, IL.
U.S. Patent No. 3,687,804 "Compact and Safe Nuclear Reactor"	Energy Conversion Systems Inc. Toronto, Ontario, Canada
U.S. Patent No. 4,094,492 "Variable Orifice Using an Iris Shutter"	B & B Enterprises Livermore, CA.
U.S. Patent No. 3,803,481 "Leak Detector"	Comstock, Inc. Oak Ridge, TN.
U.S. Patent No. 4,253,190 "Communications Systems Using a Mirror Kept in Outer Space by Electromagnetic Radiation Pressure"	Electronics Missiles and Communications, Inc. White Haven, PA.
U.S. Patent No. 4,152,248 "Hydrogenation of Coal Liquid Utilizing a Metal Carbonyl Catalyst"	Pentanyl Technologies, Inc. Boulder, CO.
U.S. Patent No. 4,169,280 "Method for Making Glass Nonfogging"	Anthony's Manufacturing Company, Inc. San Fernando, CA.
U.S. Patent No. 3,987,302 "Resonance Ionization for Analytical Spectroscopy"	Atom Sciences, Inc. Oak Ridge, TN.
U.S. Patent No. 4,274,394 "Electromechanical Solar Tracking Apparatus"	Stromberg Enterprises Albuquerque, NM.
U.S. Patent No. 3,786,838 "Method of Extracting Heat from Dry Geothermal Reservoirs"	Pan American Energy Corp. Los Alamos, NM. 87544
U.S. Patent No. 3,378,685 "Infrared Nondestructure Testing Technique" U.S. Patent No. 3,672,204 "Transient Thermal Method and Means for Nondestructively Testing a Sample"	United Western Technologies Corp. Richland, WA.

U.S. Patent No. 4,442,018 "Stabilized Aqueous Foam Systems and Concentrate"	Coulston International Corp. Albany, NY.
U.S. Patent No. 4,409,643 "Long Lifetime, low intensity, light source"	Alan M. Frank Livermore, CA.
U.S. Patent No. 3,533,273 "Thermal surface impedance method and means for nondestructive testing"	United Western Technologies Corp. Richland, WA.
U.S. Patent No. 4,265,982 "Coasted Woven Materials and Method of Preparation"	Progressive Technological Coatings, Inc. Pearland, TX.
U.S. Patent No. 3,957,031 "Light Collectors in Cylindrical Geometry"	University of Chicago Chicago, IL.
U.S. Patent No. 4,230,095 "Ideal Light Concentrators with Reflector Gaps"	University of Chicago Chicago, IL.
U.S. Patent No. 4,114,592 "Cylindrical Radiant Energy Direction Device"	University of Chicago Chicago, IL.
U.S. Patent No. 4,237,332 "Nonimaging Radiation Energy Direction Device"	University of Chicago Chicago, IL.
U.S. Patent No. 4,252,777 "Recovery of Aluminium and Other Metal Values from Fly Ash"	P.I.D. Associates Hendersonville, NC.

Information on actual commercial utilization of the licensed inventions is incomplete. Since many of the exclusive licenses (11 of 21) have been granted within the last eighteen months, it is probably too soon for significant commercialization results to have materialized as to those inventions, particularly since the underlying inventions are generally undeveloped inventions requiring substantial private development efforts. Indeed, 17 of the 21 licenses were granted in the last three years.

One licensee, Atom Sciences Inc. has advised that it has brought the Resonance Ionization Spectroscopy technology (for analysis of trace elements) to commercialization, having been financed entirely with private funds.

Other licensees have reported some progress in pursuing commercialization efforts, e.g. financing efforts, and building and testing of prototypes.

Mr. WALGREN. Let me ask you, then, to go back, and if you can, without doing a big research project that is probably not in anybody's interest, if you can give us some information about the history of the user access. And if you can add to that any documentation of the teamwork contact historically, because I think we need to know whether anything more is being done now than was being done before. If the answer is 12 additional people in the teamwork aspect, that is not enough, and we deserve to know that, the public deserves to know that, and we have to try to add more effort in that area.

So, if you could review that with some submission, give us a chance to get our teeth into it and follow up on it, I would appreciate it.

Mr. WALGREN. I wanted to just wonder with you, Mr. Constant, about these numbers in here. When we ask ourselves how well we are doing under this, we said 19 exclusive patent licenses in the last 4 years. Now, exclusive patents are really the patents that drive, as I understand it, inasmuch as if you give a nonexclusive patent, anybody can jump into the pool and operate without any direct exclusive benefit certainly. So, we are really talking about five patents, an average of five patents a year over 4 years for the whole Department of Energy. Shouldn't there be more in there than that?

Mr. CONSTANT. I do not think, Mr. Chairman, that you can overlook the nonexclusive licenses, either. Under the provisions of the licensing authority under Public Law 96-517, in order to even get a nonexclusive license, the licensee has to show a plan for commercialization of those inventions. So, even nonexclusive licenses do indicate a strong commercialization. It just happens that there are some inventions that exclusivity, for one reason or another, is not required.

So, even though, as you say, 19 is not a large number, I think you have to combine that with the 47 nonexclusive licenses and look at the total picture.

In addition, I do not have the figures with me, but those 19, are a significant increase from what the Department has done in the past. Prior to that time, I believe there were only a few exclusive licenses granted by the Department.

Mr. WALGREN. Well, that's certainly what we're trying to—that is the problem we are trying to get at, and I hope we're coming up rather quickly. If it's possible to—if anybody has this view without looking at it too long, I wonder whether those licenses, there are 19 exclusive patent licenses, can be tracked into economic activity. We know who holds them, and we know the history of their economic performance. It would be interesting to see whether it is easy to get at the increase in the economic work, whatever numbers of jobs or numbers of dollars in the bottom line of whoever holds those licenses to see if there is not some quick way to look at whether or not holding an exclusive patent license from the Department of Energy has been helpful at all in these years to that entity.

Perhaps you could give us a start on looking at that by giving us a list of who they are and any other description that you could. And maybe together with you, we could look for the rest of the answer to that question.

Mr. CONSTANT. I think, too, Mr. Chairman, in terms of exclusive licensing, the waiver numbers that I quote in there, the 600 patent applications that have been waived to contractors, in those cases they do, they have received the exclusive rights to those inventions, also.

Mr. WALGREN. The 600 come under where you waive at contracting, any interest in what comes out of it?

Mr. CONSTANT. Yes.

Mr. WALGREN. You waive at the time of contract?

Mr. CONSTANT. That number includes those inventions that were waived at time of the contracting and those that were identified when the invention arose.

Mr. WALGREN. So, approximately 550 waived at time of contract and a little over 69—47 nonexclusive and the 19 exclusive.

You mentioned 1,400 patent applications in which you retained title. How many of those were with respect to classified technology, classified areas?

Mr. CONSTANT. I do not have that information, but I could get that for you and insert it for the record.

Mr. WALGREN. I think that would be helpful to try to see what it is that the Department of Energy is retaining.

[The information follows:]

There are 95 patent applications that are classified.

Mr. WALGREN. You mentioned that you are considering field-of-use licensing for title to developments which may be directly applicable in a classified area or a sensitive area. You feel you can get that out into other fields by approving the use of patent rights for field of use?

Mr. CONSTANT. Yes.

Mr. WALGREN. Has that happened yet?

Mr. CONSTANT. No, the class waivers have not been implemented yet which will provide for that. It is not for the classified and the sensitive, but it is for the other exceptional circumstances, the uranium enrichment and the high-level waste, civilian high-level waste technologies.

Mr. WALGREN. In thinking about how fast these waivers for this class of laboratories are going to be implemented, it is my understanding that the Commerce Department is really about to do it. We know what their regulations look like. They have gone through the preliminary publication. They are about to issue their final regulations in that area. How long does it take the Department of Energy to pick those in a formal approval and sign off on a waiver for an operator like Martin Marietta at Oak Ridge?

Mr. CONSTANT. Under the class waiver, it will be done by a process located at the field level only, once the class waivers are implemented. We have no experience on those, but we are anticipating that it will be within several weeks to a month.

As an example of how rapidly we can move on such waivers, when Martin Marietta identified to us that there were a series of inventions in which they were in licensing negotiations and needed a waiver right away and which were being held up because we did not have the class waivers implemented yet, we were able to process those waivers from the time we were notified at headquarters

that they were critical, and had the waivers approved, I believe it was within 9 to 10 days after the request came in. So, we can move fast when we have to, and I believe that under these new waiver proposals, they will move much more rapidly than in the past.

Mr. WALGREN. So, you expect that to come out within, literally momentarily. So, if you are only talking about 30 days or so to implement it on the field level, by the end of September this relationship should be settled?

Mr. CONSTANT. I believe, yes, it should be.

Mr. WALGREN. Are there outstanding unresolved issues between the Government and the operator at Oak Ridge that could create problems in that they're asking for certain indemnities and that has not been agreed to yet?

Is that something which we can anticipate coming back here 6 months from now and finding that as a government we had so much difficulty with that that we decided not to do anything?

Mr. CONSTANT. I believe there are some difficulties, and there are some areas that have not been finalized. The efforts to date have been between the Operations Office and Martin Marietta. Those negotiations and the determinations that they make will come to headquarters for approval at some point. We are in anticipation of those issues coming to headquarters, already looking at them, so that we can respond to them rapidly when they do reach us formally. The whole key is getting the class waiver approved and then receiving their——

Mr. WALGREN. Do you have problems with what the field representatives of the Department of Energy have agreed to with respect to the operator in this instance?

Mr. CONSTANT. We have questions——

Mr. WALGREN. By that I mean the headquarters review function. Is that—have you identified elements which you would not agree to at this point?

Mr. CONSTANT. We haven't reviewed it formally to the point where we can say that we agree or disagree on specific points. There are areas that we will have concern and which we will have to look at very closely, and which our program people will also have to look at closely when it comes up to be sure we do not have a problem.

It is possible that we may ask them to go back and renegotiate some point to something different, I don't know, but I do not know that at this point.

Mr. WALGREN. What are the areas that are most difficult for you?

Mr. CONSTANT. It would be in the areas that I mentioned earlier. It would probably be in the area of potential liabilities from licensing activities, the allowable costs for licensing activities, the areas of conflict of interest to ensure that they have addressed them to our satisfaction.

Mr. WALGREN. Let me ask you, it's hard for that to have much life, in my mind, the area of conflict of interest. It is obvious that you can have a conflict of interest. How do you address that? What are some of the elements that go into addressing that? Or is it that we look at it and say it is acceptable or it is not acceptable conflict? How do you minimize it?

Mr. CONSTANT. Mr. Chairman, I guess what we described is the minimizing it. You can't eliminate it. There is no way that you can eliminate it. It is a fact of life. The commercialization effort raises them to a higher level than we would be faced under a normal contract activity.

The Agency, in my opinion, would be looking at them to see whether it felt comfortable that the opinions it would be receiving from its contractor, when it asked for the contractor to make recommendations in mission areas, that the contractor was aware of conflicts, problems and was doing the most it could do under those circumstances to minimize them to some acceptable level.

Mr. WALGREN. So it is more in choosing the direction of the work of the laboratory at that point. The management of the laboratory, you want to be sure, guides the laboratory in an area toward the maximum public interest as opposed to pursuit of a more narrow interest. And you want to see that issue considered in a management structure. Is that what you are saying?

Mr. CONSTANT. Correct, yes.

Mr. WALGREN. Thank you, Madam Chairman.

Ms. LLOYD. Thank you, Mr. Walgren.

And thank you, Ms. Joseph and Mr. Constant. You have proved to be very good witnesses and we appreciate your ability and appreciate your being here today.

Our next witness is Mr. William Carpenter. Mr. Carpenter is vice president of technology applications at Martin Marietta Energy Systems. Martin Marietta, as everyone here knows, operates the Oak Ridge National Laboratory. We are particularly interested in what Mr. Carpenter has to say, since I hear that you are known as the godfather of technology transfer for the lab. So, we are very interested in your remarks today.

We do have a copy of your complete statement. You may summarize or proceed as you wish.

STATEMENT OF WILLIAM W. CARPENTER, VICE PRESIDENT, TECHNOLOGY APPLICATIONS, MARTIN MARIETTA ENERGY SYSTEMS, INC., OAK RIDGE, TN

Mr. CARPENTER. Thank you very much, Madam Chair. Good morning, ladies and gentlemen.

I have prepared a written statement and it is available in the prescribed number of copies. So, I won't spend a great deal of time in summarizing that.

To listen to the preceding discussion has been helpful. And perhaps in addition to a brief summary of my submitted testimony, I can address our view, the view of Martin Marietta related to some of the issues that your committees have already surfaced.

First of all, let me say that, as a corporation we are indeed—I hope we are both a large firm and a profitmaking firm. That is our objective. And although it complicates the issue of the patent policy, I hope no apology is required for either circumstance. As a company, we certainly endorse the positions that your committee has taken in terms of both the need and the method for accelerating technology transfer and the benefit to us as a Nation, that we think you are on a very pertinent and vital issue. We are support-

ive really of the measures that we have seen come out in revised and improved legislation dating from 1980.

We, of course, in viewing the potential long range benefit of technology transfer, one must conclude, and we certainly agree, that technology is going to be—good technology is going to be a primary determinant in the future economic health of our Nation and our ability to compete internationally to a good extent.

The U.S. Government is the largest creator of technology in the free world. When we spend, from the U.S. Government approximately $50 billion a year, and that constitutes not only half of our total R&D expenditure investment as a Nation, but it consumes half of our very valuable skill pool of scientists and engineers. And we certainly agree with what we feel the sentiment of your committee activities have been, to recognize that we can no longer afford to partition off Government R&D and consider it separate from commercial derivative advantage.

We must get two for the price of one if we're going to compete weil with the Japanese and West Germans, and we should indeed be able to, when our expenditures on R&D, as a nation, exceed the total expenditures of Japan, West Germany, France, and the United Kingdom put together. So we should fare better than we are in the technology competition on an economic front.

In order to do that, we should seek larger commercial advantage, derivative advantage of our Government R&D expenditures. We think the potential for that, although the track record in technology transfer has been encouraging since 1980, it is our view that we have not yet really tapped the potential of identifying commercial advantage from these Government R&D expenditures.

As has been noted, Martin Marietta is the operator and managing contractor for the Department of Energy facilities here in Oak Ridge. We have had that happy responsibility since April of 1984. When we were engaged in the competition to operate and manage those facilities in 1983, we sensed that the mood was that we should propose bold measures to accelerate technology transfer and that the environment was correct, it was receptive, and that this large shift in national policy was more possible in 1983 than it had ever been before. And so we were asked by the Department of Energy, who I think also sensed this changing mood; and, of course, as you know, it was 1983 when the so-called Packard Report came out and was critical of the total benefit to the Nation of our national laboratory endeavors. Certain other authoritative reports came out at that same time. The ERAB Report, Energy Research Advisory Board, themselves were critical of the benefit to the nation that was deriving from national laboratory expenditures. Several other reports contributed to the mood that people were ready to do business differently, we thought.

We proposed in our proposal to manage these facilities in 1983 four basic measures, a very broad thrust that we thought if we were able to implement them all, we could make a big difference in the way that the benefit of Oak Ridge National Laboratory and the other facilities here, their commercial benefit.

These four measures were, first of all, the establishment of a central office at an executive level to manage not only the technology transfer activities that derive, and opportunitites that derive from

Oak Ridge National Laboratory, but the Y-12 weapons plant and the enrichment enterprises. In other words, the extent to which technology transfer had received emphasis in Oak Ridge, prior to 1983 was pretty much concentrated in the laboratory. And we felt there was good, worthy technology yield from Y-12 and from the enrichment enterprises, and that we should establish a central office to coordinate all of those in a systematic way.

That was one measure we proposed. The second measure was the one that has received discussion earlier this morning. That is our application for an advanced patent waiver. That was the second measure.

I'll discuss our view of that and the aspects of the program that we proposed a little bit later. But it was a very central request and central to our ability to do well in technology transfer.

The third measure, we proposed to implement an array of inventor awards for our people. It's not our feeling that you can either turn on or turn off creativity. Creative people are going to create wherever they are. But a fair way of rewarding them does encourage them to record their ideas. And so we proposed that as an additional and third measure.

Finally, the fourth measure, it was our view that many ideas—and I think perhaps this gets to one of the questions that you asked a little bit earlier, Mr. Walgren. And that is, can you ever count or quantify the benefit of a successful technology transfer.

Well, if you use it to form a new business, which is one preferred mechanism, in our view, it is fairly easy to count the jobs that derive. If, on the other hand, we assign a license to a large company like IBM, or Martin Marietta, or 3M, it is a little difficult to quantify whether or not they—well, we can tell whether or not they paid their royalty fee, but we don't know how many jobs we've created, or it's difficult to calibrate the extent to which it is actually being exploited correctly.

But we think a preferred mechanism often, in radically new, different ideas and inventions, a preferred mechanism to export it is to use it as the basis for a new business. Large firms don't operate well on dramatically different ideas. You know, I say that representing a large firm, you know, we don't do well on small, new ideas. We change what we are doing to improve it. But to adopt a completely new policy is difficult for a small firm. And so, we prefer the formation of new businesses as a mechanism. And we have established at our corporate investment the Tennessee Innovation Center as a supportive and nurturing mechanism to not only assist in new business formations but to cause new business formations.

Of these four measures, establishment of an executive office, requesting a patent policy, or requesting a patent waiver, implementing inventor rewards, and instituting a support mechanism for new businesses, we have in place three of those four measures. The objective that has eluded us so far is to finalize, of course, and obtain the patent waiver. And we consider that a crucial aspect of our ability to really capitalize on technology transfer.

Now we do believe that the activity is up, that the pace of tech transfer has, indeed, accelerated. As an example, I would like to note that the number of publications that our scientists and engi-

neers have generated in 1984 is up over 1983 by about 10 percent. That reverses a trend, a 5-year trend in decline. The number of invention disclosures likewise are up for the first time in 6 years. So the technology is taking place. It is high quality technology. And given the additional liberties that we are asking for in the patent policy, we think that we can make dramatic improvement in commercializing some of these.

I would like to move to the constraint that we are operating under. Our apparent inability, so far, at least, to obtain on any general or blanket basis, the patent rights. And I would like to explain the program that we have proposed to the Department of Energy.

We proposed it both during negotiation in the first quarter of calendar year 1984, and unable to agree prior to signing the contract in April 1984, we proposed it formally in an advance blanket patent waiver petition in April 1984.

We are asking the Government to give us title to the patents, as a corporation, give us legal title to the patents. And, having done that, we will act to advance the objectives of the Government by being in a position to readily reassign those to commercial clients based on the criteria of who can we assign it to that gives us maximum commercial penetration. In many cases, we will be able to assign royalty arrangements to the licensing arrangements. What we would propose to do with the royalty incomes, we will put it in a separate set-aside account and spend that for three purposes.

No. 1, we will permit the inventor to directly share in that. That is a little unusual for industrial firms to volunteer to that, but it would be consistent with the way we handle our aerospace company right now. That would be the first claim on those revenues, a minor claim.

The second claim would be to pay for patent processing costs and to defend any attack on our patent positions.

And the third method, the third purpose of those revenues would be to rededicate those moneys within the institutions that we operate for the Department of Energy to other technologies to bring them to the point of being commercially attractive.

In other words, I think the fundamental point is that we would never, as a corporation, profit from any of these moneys. We have proposed provisions that would see us, in the instance of the patent waiver, behaving just as a nonprofit corporation. In fact, we think that we are asking for less privilege than is already being accorded to the university-managed GOCO's, because in those cases where our parent firm might wish to use the technology, we're volunteering to pay a royalty just like everybody else. In the negotiation of that royalty in that case we would defer to the Department of Energy, to maintain an arm's-length relationship and to minimize, if not avoid altogether, a conflict position.

So, we think that, even in the provisions of the program that we recommended a year and a half ago, that we are quite consistent, that the wisdom of that has been confirmed by legislation that was already passed last fall applying to the universities and the nonprofit firms. So it looks to us like we are right on target with the will of your committee and the will of Congress. And, of course, from our point of view, we think that we have adopted a very self-

less position from the standpoint of our corporation, and that our application ought to be picked up in a heartbeat.

I might say that the economic dividends of this program, should we get the patent request in place, will be significant in our view. We believe that a lot of new company formations, spinoffs, will take place. They will prefer to locate right here, and that will be an advantage to them. We think that other large firms, large and small, will wish to locate R&D activities in this area because of the advantages of the one-to-one interactions that can take place in such a preferred manner if you locate right where the technology platform exists, which we think is in Oak Ridge, TN.

So it is important to the region as well.

I believe that I will stop and would be happy to entertain any questions the committee might have.

[The prepared statement of Mr. Carpenter follows:]

U. S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE AND TECHNOLOGY

JOINT FIELD HEARINGS ON "TECHNOLOGY TRANSFER AND PATENT POLICY: DOE AND OTHER PERSPECTIVES" BY THE SUBCOMMITTEES ON ENERGY RESEARCH AND PRODUCTION AND SCIENCE, RESEARCH AND TECNOLOGY ON JULY 15, 1985.

STATEMENT OF WILLIAM W. CARPENTER, VICE PRESIDENT, TECHNOLOGY APPLICATIONS, MARTIN MARIETTA ENERGY SYSTEMS, INC., OAK RIDGE, TENNESSEE.

The Importance of Enhancing the Technology Transfer Process

We, at Martin Marietta Corporation, agree with those who observe that the growing reliance on higher levels of technology has become a fundamental, long-term trend in the U.S. economy. It has become increasingly clear to us and others that the future of the economy will be largely dependent on how well new technologies are put to use to create products, markets, jobs, and returns on investments. Because the federal government contributes over $50 billion - or roughly half of the total national investment in research and development - the future of the economy will depend, in part, on how well the inventions and new technologies that result from federal efforts are put to use by the private sector.

There is broad agreement that with about $18 billion going to the federal laboratories employing one sixth of the nation's research

scientists and engineers, improved means of increasing the flow of technology from these laboratories to the private sector must be found. A number of recent reports have underscored the need for federal laboratories to play an increased role in improving economic productivity through technological innovation. A 1983 report by the White House Science Council, the so-called Packard Report, stated:

> The National interest demands that the federal laboratories collaborate with universities and industry to ensure continued advances in scientific knowledge and its translation into useful technology. The federal laboratories must be more responsive to national needs.

Similar sentiment was espoused in a 1983 report by the National Governors' Association stating:

> The fact remains that these national laboratories are far from having begun to realize their full potential as catalysts for close industry-university research cooperation or as collaborators in joint university/industry research.

We support all the recent initiatives by the federal government to enhace the transfer of federal technology to the private sector. However, to agree upon the objective is much easier than succeeding with the process.

In the 1983 competition for the Oak Ridge facilities management contract, DOE asked the bidders to propose resourceful measures to accelerate the process of technology transfer. Martin Marietta proposed four primary measures:

1. Broaden the scope of existing technology transfer functions to include all operating facilities under the management contract and establish a central function, headed at the executive level, that would not just permit but would cause increased levels of technology transfer.

2. Put the title to all intellectual property of commercial value in the contractor's name under the terms of an advanced blanket waiver.

3. Develop and implement an array of financial rewards and recognition for the inventors.

4. Create supporting mechanisms to cause and encourage new business formation based on Oak Ridge-developed technologies.

Of the measures requested, all have been accomplished and are in place except the second. We still lack what we consider to be the most important tool - the ability to control the rights to patents issued on technologies invented at the Energy Systems facilities. In spite of this major constraint, we have proceeded to vigorously institute a program that, should we finally be granted the patent waiver we seek, will enhance the rate of successful transfers of technologies from the Energy Systems facilities to industry. Although the measures we have taken has already led to a significant increase in interest in our technologies expressed by industry, our inability to offer suitable licensing arrangements has discouraged these companies from pursuing the further commercial development of the technology. Before turning my attention to the constraint on technology transfer posed by our lack of control of our patent portfolio, I would like to describe for you some of the measures we have already taken.

Martin Marietta's Initiatives in Oak Ridge

We have created an executive office of Technology Applications (OTA) under my direction. The Office is staffed by a group of professionals with the spectrum of functions to centrally administer the total technology transfer process for all activities under the management contract. OTA has examined the existing functions at Energy Systems. We have developed and implemented new standard practice procedures to coordinate and improve each step of the process. New procedures include:

* Technology Transfer Assessment and Development Process for determining the transfer potential of inventions;

* Awards for Inventions that provides a schedule of cash awards to inventors for patent applications;

* Royalties from Licensing that provides a means for sharing royalty income with the inventors named on licensed patents; and

* Intellectual Property Rights covering employees' rights and responsibilities in reporting all inventions developed in the course of their employment at Energy Systems.

To further stimulate our inventive employees, we have instituted other measures in addition to providing cash awards for patent applications and sharing royalties with inventors. We have created the Inventors' Forum to encourage exchange of ideas and to facilitate intersite communications. The Forum is an employee-managed organization of all Energy Systems patent holders. The kickoff meeting of this organization was held April 30 at the annual patent luncheon. A new feature of this awards luncheon was also introduced - Inventors' Forum lapel pins to recognize Energy Systems patent holders.

Recognizing that most technology transfer occurs from one-on-one interactions between our researchers and industry's, we have taken steps to allow and encourage these types of exchanges. It is our belief that we can accelerate technology transfer by freeing our people to perform as consultants to outside firms. We recently implemented a revision of our consulting policy consistent with DOE's desire to further liberalize the employees' ability to engage in these interactions outside of the course of their normal work activities.

Initial Impact of Technology Transfer Program

Evidence abounds to show that acceleration in the process of technology transfer is already taking place in Oak Ridge.

* Inventions disclosures are up over 15% during our first nine months of performance - reversing a five-year declining trend.

* Publications are up 5% - also a trend reversal.

* Since the fall of 1984, nine workshops or conferences related to technology transfer have been presented - a 50% increase over FY 1984 - with a combined attendace of 2400.

* Energy Systems now has 60 Technical Bulletins in the preparation and publication stages; 1985 will be the biggest year ever in bulletin publication by a factor of 2.

* A high number of inquiries have been received from commercial firms, many of them inquiring of Oak Ridge for the first time.

* Even though Energy Systems has not yet received title to the intellectual property, we are in the process of prenegotiating licenses with several commercial firms.

OTA has been identifying technologies with commercial potential, documenting the present status, and then developing marketing strategies for them. As a result of our initiatives, we have begun to take action on nearly 50 different technologies with commercial value. We believe that about one-half of these have near-term commercial potential. These technologies include:

* Nickel-iron aluminides, a superalloy that gets stronger as temperatures get higher which has potential applications in heavy duty diesel and gas turbine engines, die material, specialty fastners, and tubing;

* Lead-iron phosphate glass, a highly durable, easy to process material that has several unique optical properties which make it attractive for precision lenses, optical fibers, glass-to-metal seals, and encapsulation of semiconductors used in hazardous environments;

* Silicon carbide whisker-reinforced alumina, a very tough, fracture resistant ceramic material useful for cutting tools, recuperator tubes in gas-fired furnaces, and armor plating for tanks;

* An economic ion-implantation treatment that virtually eliminates wear/corrosion as a clinical problem for artificial hip- and knee-joint prostheses made of a titanium alloy; and

* Clinical radioisotope generator for use in evaluating cardiovascular defects and blood flows in young patients.

A number of unpatented technologies have been transferred in recent months, including:

* Ion-implanted prosthesis to Spire Corporation and Johnson and Johnson;

* A non-force-reflecting manipulator system to Remotec;

* Tritium light source to Safety Light Corporation, NRD (Division of Mark IV Industries), and Self-Powered Lighting Corporation; and

* Diffuse reflectance cell to Harrick Scientific Laboratory.

Many of our technologies with commercial value, however, need considerable refinement before they are ready for the commercial marketplace. This is especially true since the commercially attractive concept is often only tangential to the main purpose for which the research was conducted, and DOE program managers cannot justify spending federal funds to test out the viability of commercial applications. We have recently initiated two programs in conjunction with the DOE to help promote the transfer of such promising, but not yet mature, technologies.

In 1984, DOE agreed to give $100,000 to ORNL on a matching basis to identify commercially promising developments and allow additional work to bring the technology to a stage where industry could make an assessment of its true commercial potential. From 22 candidates for funding, five technologies were selected to receive funds. The items in Table 1 were chosen for support. Based on the success of the first year effort, the program has been expanded this year to support the further development of six more technologies (see Table 2).

Another new initiative supported by DOE is the Industry Technology Exchange Research Program. The purpose of this program is to support visiting research appointments at ORNL for scientists and engineers currently working for industry. This program allows the

Table 1. Technologies with Commercial Potential Funded in 1984

Technology	Action
1. Nickel aluminide alloys	In licensing negotiations
2. Pulsed helium ionization detector	Invention disclosure filed; 1985 I-R 100 award winner
3. Continuous annular chromatograph	Inventions disclosure filed; instruments loaned for test
4. Electronic autofluorography	Invention disclosure filed;
5. Remote analytical instruments	Displayed at trade show

Table 2. Technology Maturation Initiatives Funded in 1985

Technology	Purpose
1. Pulsed Helium Ion Detector	Electronic design, testing, and information dissemination
2. Nickel Aluminide Alloys	Casting optimization, sample production and testing
3. Ceramic Composites	Sample production and testing, information dissemination
4. Biocatalyst Beads for Fermentation	Sample production and testing, information dissemination
5. Simplified Blood Processing System	Prototype development and testing
6. ANFLOW	Design development and optimization and costing
7. Evacuated Insulation Panels for Energy Efficient Appliances	Joint Development of commercial prototypes with manufacturer
8. Lightweight Oxide Fiber Composite	Fabrication of test hardware and performance testing

visiting researcher to work side-by-side our staff members to give them exposure to our developments along with hands-on experience with the technology. It is expected that this process will help deepen the understanding of the new technology and speed the adoption process when the researcher returns to his company. We have two such researchers presently on site: one from CPC International working in our Biology Division on anaerobic enzymes for food processing and one in Metals and Ceramics Division working on metal to ceramic joining.

Admittedly, the ultimate commercial potential for many of our technologies spans a wide range from a few million dollars in sales to possibly over one hundred million dollars; if our market studies of the nickel-iron aluminide alloys is correct. It should be noted, however, that some of the technologies developed at the Energy Systems facilities do have the potential of changing basic industries within the U. S. and strengthening our competitive position in the international marketplace. Just one example will illustrate my point.

Seeking to capitalize on the wealth of technical talent and expertise in material science at national laboratories, a consortium of U. S. steel companies, including Bethlehem, U.S. Steel, Armco, National, and LTV, are working with Oak Ridge and Argonne. The idea is to develop leapfrog or breakthrough technologies which could help the domestic steelmakers regain its competitive position in world steel markets. One thrust of the program will be to find new ways to convert iron ore into liquid metal, bypassing the expensive coking ovens and blast furnaces now used. Another focus will be on casting liquid metal into pieces close to the dimensions of the final product. One possibility is to use powerful magnetic fields to confine the molten metal so it can be cast

into thin sheets, eliminating the need for strip mills to flatten thick billets. ORNL's fusion program will contribute its magnet expertise to the problem of casting steel.

Technology Transfer and Local Economic Development

We are convinced as our technology transfer program matures, it will begin to have a significant positive impact on the economic development of this region. It does not appear to be an accident that technology complexes such as the Silicon Valley, Boston's Route 128, and Princeton's Forrestal Center have evolved around major universities. Direct access to a university and the university's right to transfer the results of its research on an exclusive basis are important to develop and commercialize technologies. Other forms of assistance such as consulting, continued involvement of researchers in the commercialization process, and various business services are also important.

As we continue to make technologies more accessible to commercial firms, we expect three things to begin to happen that will have a positive impact on the local economy. First, established firms will desire more direct interactions with Energy Systems staff and facilities in the form of collaborative R&D. This activity has already begun to expand. In the Metals and Ceramics Division, for example, in addition to the steel industry initiatives, there are major collaborative R&D agreements in place with Cabot Corporation, Cummins Diesel Engine Company, and Babcock and Wilcox. Other similar scale projects are being developed with Atlantic Richfield Company and 3M among others.

Second, an established firm may wish to locate an operation or an R&D activity in the Oak Ridge vicinity in order to better access the

technology developed here. In fact, this has already begun. Manufacturing Sciences Corporation chose the Oak Ridge location because the Energy Systems committed to cooperate with them and offer them technology access in their commercial endeavors to roll and form depleted uranium. Their plant, now under operation, will employ 25 people within the next few months. They have used some Energy Systems employees as consultants. Based on discussions we have had with other companies looking for expansion opportunities, we believe that other firms, perhaps on a much larger scale, will take similar action in the future.

The third local economic dividend from technology transfer is new business formation. We continue to believe that one of the most promising avenue of successful technology transfer is often the formation of a new business based on that single technology. Our conviction on this matter is such that the Martin Marietta Corporation has invested several million dollars in the establishment of the Tennessee Innovation Center. Martin Marietta Corporation formed a partnership with the Utah Innovation Center to help facilitate the transfer of technology from the research stages at the Oak Ridge facilities to successful commercial enterprises.

The purpose of the Center is to create a favorable climate for new business formation and to assist start-up companies in overcoming the inevitable obstacles. Since the task of the entrepreneur is to conceive, produce, market, and manage new products is difficult, complex, and risky, the Center will provide needed assistance to enhance the probability of success for the new venture. To that end, the Center will join with the entrepreneur to become a full business partner. With

its network of resources, the Center will assist the entrepreneur so he/she can better run the company. It will provide:

* input in developing the initial business plan,
* office and laboratory space,
* management and technical aid,
* legal and accounting assistance,
* help in arranging financing for operating expenses, and
* use its experience and skill to raise investment capital.

The Tennessee Innovation Center is modeled after the Utah Center - a private-for-profit corporation based in the University of Utah's Research Park. The Utah Innovation Center was originally formed in 1978 by the University of Utah through a National Science Foundation grant. In 1982, Dr. Wayne S. Brown, a faculty member of the University of Utah, College of Engineering, and former Dean of the Engineering School; and Don A. Stringham, a local attorney, converted the Innovation Center from a university-based experiment in technology transfer into a private corporation.

The Tennessee Innovation Center will be located in a modern, new 50,000 square foot facility. The facility will contain central laboratories, computer, telecommunication, and administrative support services. Martin Marietta Corporation has made a multi-million dollar commitment to provide for the operation of the Center and to establish a seed capital pool for new, start-up ventures. In addition, the Center is exploring the feasibility of establishing a R&D Limited Partnership pool to fund the further commercial development of technologies invented at the Oak Ridge facilities.

The Innovation Center has already associated with or established six new, small, high-technology businesses. The Innovation Center is in the final negotiation stages with another four new businesses. Of these

ten initiatives, eight are based squarely on Energy Systems/DOE-developed technologies.

Constraints Imposed on Energy Systems Technology Transfer Program

We believe that considerable progress in improving the technology transfer process has been made in the past year. We think that our record speaks clearly on that point. We have developed and implemented a comprehensive system to identify technologies with significant commercial potential and reward their inventors. We have begun marketing efforts to bring these technologies to the attention of prospective industrial clients that has led to a significant increase in the interactions between our research staff and their counterparts in industry. A number of new companies have been started in Oak Ridge to capitalize on technologies developed at the local facilities. We have also transferred a number of technologies to other, existing commercial companies.

All of the technologies transferred, however, were unpatentable. These technologies were transferred to companies hoping to exploit a small niche that was, and would continue to be, overlooked by the major forces in the market. These market niches are attractive to small companies, but do not present enough opportunity for larger concerns.

Unfortunately, because we can not provide a company access to the patent rights to our inventions, we have had only limited success in developing agreements with industrial clients to exploit some of our most commercially exciting new developments. The importance of patent protection to protect a company's investment was clearly demonstrated recently at Los Alamos National Laboratory. Researchers at Los Alamos have invented and patented a laser-based technique capable of detecting

bacteria and viruses quickly and inexpensively. They estimated that it would take millions of dollars, however, for a commercial product to realize this potential. After the lab obtained the rights to the invention from DOE and the authority to perform proprietary research for private sector organizations, Los Alamos was able to negotiate a license agreement with a new, small business firm, Mesa Diagnostics, to develop and produce the device. Mesa Diagnostics has raised over $8 million through venture capital and research and development limited partnerships to fund this effort. $4.3 million of this amount will be used by Los Alamos to further develop the technique to serve both the DOE and medical diagnostic purposes. It is very important to note that these agreements could not, and would not, have been completed if Los Alamos did not have the ability, in this case, to provide an exclusive license of the patents to Mesa Diagnostics.

Obviously, patents are only one factor in a decision to invest in the creation of a new product. The ownership of inventions and the patents that cover them are, however, an important factor in new product development. Most companies are reluctant to invest the large sums required to fine-tune inventions without the guarantee that a competitor would be precluded from copying the product by reverse engineering. When faced with a choice between investing in the exploitation of a government-held patent with significant commercial potential and a privately-held patent, even with less commercial potential, most companies will decide against the government patent opportunity because of the lack of protection.

Thus, we firmly believe that our inability to negotiate licensing arrangements for our technologies is the single, greatest obstacle to our

operating an optimally effective technology transfer program. Although many of the companies exposed to our inventions have expressed great interest in developing a commercially viable product based on our technology, none are willing to commit the significant resources necessary for such an undertaking without the proper patent protection.

Martin Marietta's Proposed Solution: An Advanced Blanket Patent Waiver

In order that we might be in a position to offer the necessary patent protection to commercial clients interested in further developing products based on our technologies, we originally proposed that we receive an advanced blanket waiver of patent rights from DOE as part of our management contract. Unable to agree upon this clause of the contract, we agreed to delay final resolution of this issue until after the contract was signed. We subsequently petitioned DOE to grant us this waiver. Our patent waiver proposal was subsequently endorsed in the DOE patent policy directive issued by then-Secretary Donald Hodel on 5 February 1985. As you can see from the chronology of events in Table 3, we have been unsuccessful in obtaining DOE approval for this petition to date.

Without the requested advanced waiver, Energy Systems would have available only the procedure for petitioning, on a case-by-case basis, for a waiver of patent rights on each invention after it is made. This is a cumbersome and time-consuming procedure and, historically, has not yielded a satifactory result.

Waiver petitions require the description of plans for exploitation. Given the large number of invention disclosures generated at the

Table 3. Patent Waiver Petition Chronology of Events

Action	Date
Energy Systems signs management contract without advanced blanket patent waiver	March 30, 1984
Jarmolow and LaGrone sign memorandum of understanding to negotiate and implement waiver by August 30, 1984	March 30, 1984
Advance blanket patent waiver petition sent to DOE	April 30, 1984
Petitions Ni_3Al individual patent waiver petitions set to DOE	June 8, 1984
Jim Eisel, Martin Marietta Patent Counsel, made trips to Oak Ridge to negotiate the advanced blanket patent waiver provisions	June 26 & 27, July 11, 12, & 13, Aug 21 & 22, 1984
Substitute Ni_3Al waiver petitions filed	Sept 25, 1984
Additional Ni_3Al petitions filed on new discoveries	Oct 18, 1984
P.L. 98-620 amendment to Patent Act 35 USC 200	Nov 9, 1984
Hodel Memo regarding DOE Patent Policy	Feb 5, 1985
Additional petition filed on long-range ordered alloys	March 22, 1985
Specimen patent license agreement set to DOE-ORO	March 29, 1985
Jarmolow letter to LaGrone regarding petition status	March 29, 1985
Department of Commerce regulations on P.L. 98-620 published for comment	April 11, 1985
Dingell letter to Herrington concerning waiver petition	April 22, 1985
DOE grants individual waivers on Ni_3Al cases subject to: (1) DOE comment on license agreement, (2) signing confirmatory license agreement, and (3) holding royalties pending DOE decision on manner of treatment	June 21, 1985

administered facilities (about 250 last year alone), it would be impractical to apply for individual waivers on the vast majority of inventions. Without the advanced waiver, we are able to seek waivers only for the few inventions that appeared to be sure winners, and/or for which a definite plan for development and exploitation exists. We have already gone through this laborious process on 31 cases. Table 4 lists these cases along with their current status. The necessity of seeking case-by-case waivers would result in a large number of inventions being put on the shelf because there were no immediate and sufficiently well defined plans for commercial exploitation.

The value of the intellectual property is often perishable with time. The ability to make timely decisions is important in order to respond quickly to industrial requests for licenses. Inventions developed at the Oak Ridge-Paducah facilities tend to be on the leading edge of technology and are, thus, highly susceptible to rapid change. Delays in assigning licenses can often result in missed opportunities to successfully transfer the technology either because alternative technolgies are developed, the market opportunity to capitalize on the project passes, or the company grows frustrated and loses interest in the technology.

Implementing the Patent Waiver Process

If the advance waiver is approved, Energy Systems, would then have the right to patent all inventions made under the operating contract except inventions in:

* certain programmatic areas of technology which are certified by DOE to be in the national interest for the Government to retain title (e.g., nuclear weapons and naval nuclear propulsion), and

* international agreements of the U.S. Government.

Table 4.

SUBJECT INVENTION PATENT WAIVER PETITIONS

CNID NO.	DATE SUBD.	STATUS	SUBJECT	ACTIVITY UCC Letter	Inventor(s) Letter		
4503-X/S-61,834	11/26/84	Disclosed	Extended Range Counting Pulse Counters	01/02/85			
4513-X/S-61,875	11/26/84	Inactivated	Improved Radioluminescent Light	01/02/85	12/03/84,	12/03/84 12/15/84	- Withdrawn 4/2/85
4207-Y/S-58,019	11/26/84	Application Filed	Zr0 Carbon Free	02/12/85	12/04/84,	12/05/84 12/12/84	
4477-Y/S-61,184	11/26/84	Application Filed	Electrochemical Cell	01/02/85	12/03/84,	12/04/84	
4514-Y/S-61,848	11/26/84	Application Filed	Electrode Controller	01/02/85	12/04/84,	12/04/84	
4392-K/S-60,513	11/26/84	Disclosed	Remote Tong Tool Catch for Servomanipulator	01/02/85	12/04/84		
4340-K/S-59,925	11/26/84	Application Filed	Laser Cooling	01/02/85	12/04/84		
4345-K/S-59,963	11/26/84	Approved	Clarification Process	01/02/85	12/04/84 12/07/84		
4381-K/S-59,987	11/26/84	Approved	Expanding Mandrel	01/02/85	12/10/84		
4434-K/S-60,595	11/26/84	Application Filed	Viscosity of Centrifuge Damper Fluids	01/02/85	12/04/84		
4484-K/S-61,826	11/26/84	Disclosed	Alarm Circuit Optical Interface Security Device	01/02/85	12/04/84,	12/04/84 12/05/84	
4374-K/S-59,962	11/26/84	Inactivated	Constant Temperature Oven	01/02/85	01/11/85		- Withdrawn 4/2/85

Table 4 (cont).

SUBJECT INVENTION PATENT WAIVER PETITIONS

CNID NO.	DATE SUBD.	STATUS	SUBJECT	ACTIVITY UCC Letter/Inventor(s) Letter		
4338-X/S-59,268	09/25/84	Executed	NiAl	11/21/83	09/21/84, 09/27/84	- Granted 6/21/85
4412-X/S-61,109	09/25/84	Application Filed	NiAl	11/21/83	09/21/84, 09/21/84	- Granted 6/21/85
4531-X/S-61,893	10/18/84	Approved	High Temp NiAl	01/02/85	01/08/85	- Granted 6/21/85
4442-X/S-61,111	11/26/84	Application Filed	Pb Fe PO_4 Glass	01/02/85	12/03/84, 12/03/84	
4451-X/S-61,153	11/26/84	Application Filed	Ceramic Composites by Chemical Vapor Deposition		12/10/84	
4488-X/S-61,825	11/26/84	Executed	Ceramic Composites		12/14/84, 12/18/84	
4536-X/S-61,894	11/26/84	Application Filed	Method for Joining	02/12/85	12/04/84, 12/04/84 12/05/84	
4511-X/S-61,853	11/26/84	Disclosed	Plastic Semiconductor Barrier Diode	04/02/85	12/15/84, 12/16/84	
4385-X/S-60,520	11/26/84	Application Filed	Servomanipulator	01/02/85	12/04/84, 12/10/84 12/10/84	
4507-X/S-61,896	11/26/84	Disclosed	Tong Actuator Servomanipulator	01/02/85	12/04/84, 12/04/84	
4508-X/S-61,874	11/26/84	Disclosed	Master Controller for Servomanipulator	01/02/85	12/10/84, 12/10/84	
4501-X/S-61,844	11/26/84	Application Filed	Pulsed He Ionization Detector	01/02/85	12/04/84, 12/04/84	

Table 4 (cont).

SUBJECT INVENTION PATENT WAIVER PETITIONS

CNID NO.	DATE SUBD.	STATUS	SUBJECT	ACTIVITY UCC Letter/Inventor(s) Letter
4406-X/S-60,528	03/22/85	Application Filed	Silicon Carbide Wisker Reinforced Ceramic Composite	
4538-X/S-62,523	03/22/85	Disclosed	Filler Metals for Direct Brazing of Ceramics	
4544-X/S-62,552	03/22/85	Approved	Oxidation Resistant Filler Metals for Direct Brazing of Structural Ceramics	
4489-X/S-61,824	03/22/85	Application Filed	Improvement in Long-Range Ordered Alloys	
4490-X/S-61,831	03/22/85	Application Filed	Improved Metallic Glass	
2-X/S-61,854	11/26/84	Disclosed	Plastic Semiconductors	

It is Energy Systems' intention to pursue patents only in those cases where inventions are determined to have commercial value and not within the exceptions stated above. Historically, 10 to 20 percent of the patentable ideas coming out of the Oak Ridge activities are thought to have significant commercial value. In these cases only, Energy Systems would make patent applications and be responsible for patent maintenance costs as an effort under the management contract.

When Energy Systems determines that inventions do not hold commercial value, DOE would be so notified. In these cases, DOE would proceed with those patenting actions which they determine to be appropriate.

Energy Systems would then search for licensees who have a high probability for the fullest exploitation of the commercial potential of the patent. The objectives in the placement of these patents would be: (1) successful transfer and adoption, (2) maximum commercial penetration, and (3) royalty incomes in return for the rights assignments. In the process of evaluating the applicants, any interests of the inventor would be given first consideration. The government would, of course, retain rights for royalty-free use.

Disbursement of Royalty Revenues

None of the income generated from the licensing of patent rights would become Energy Systems income or profit. The money would flow to a separate Energy Systems account where it would be used exclusively to advance DOE's stated objectives regarding technology transfer. First, this fund will be used to pay inventors their share of the royalty income. Second, royalties would be used to cover expenses incidental to patenting and licensing inventions. Finally, the remainder

of the fund will be rededicated to fund selected technology maturation initiatives directed toward bringing new developments to a state where industry could make a better assessment of the true comercial potential similar to those already being undertaken.

Martin Marietta Corporation's Rights

In order to restrict the possibility that Energy Systems' parent corporation might receive an unfair competitive advantage through preferred access to the technologies developed at the Oak Ridge-Paducah facilities, the basic management contract between DOE and Martin Marietta Energy Systems, Inc. establishes an "arm's length" relationship between Energy Systems and Martin Marietta Corporation. The procedures for granting Martin Marietta Corporation access to technologies developed by Energy Systems are stipulated in Contract DE-AC05-84OR21400.

In general, these procedures state that in those cases where Martin Marietta Corporation is interested in obtaining a technology developed by Energy Systems, the Corporation, with only one exception, will not be treated differently from any other company seeking similar access. The exception is that whereas all other companies will state their interests and negotiate a license with Energy Systems, to avoid a conflict of interest situation, Martin Marietta Corporation must make its interest known to DOE in the form of a request for a license. DOE will conduct all negotiations with the Corporation regarding the terms and conditions of the licensing agreement.

In a very real sense, the Corporation is actually asking for less advantage to their firm than has been available to DOE contractors in the past. The previous contractor was granted the right to file for

individual patent waivers in order to take title to the invention. Martin Marietta Corporation, however, will be required to negotiate royalty-bearing licenses.

Consistency with the Intent of Most Recent Changes in Federal Patent Policy

In reviewing the trends in federal patent policies, especially over the last five years, we have come to firmly believe that the program I have outlined for you here is perfectly consistent with the intent of Congress. Indeed, we believe that we are actually asking for less liberties than our counterpart university contractors were granted with the passage of P.L. 98-620 last year. In granting our request for a patent waiver, the government would have lost nothing pertinent to the interests of the technology developer. Martin Marietta's sole gain is in their ability to perform well regarding our contract responsibilities for technology transfer. The real beneficiary is the government in that this procedure offers great potential for advancing the technology transfer process.

If this remaining constraint is removed from Energy Systems, we believe that our technology program will become a model for other federal laboratories to follow. Granting our waiver petition will be a signal that will not be overlooked by the commercial sector. Facilitating the access to our technologies has, and will continue, to prompt firms to look more closely at what we are creating. The frequency of interactions between our research staff and industrial concerns will definitely increase. Through these interactions, technologies with significant commercial potential are more likely to be brought to the attention of industry in an efficient and effective manner.

Such linkages government and industry are essential if the results of federally-sponsored R&D are to be applied in the commercial, as well as the government, sector of the economy. Only when our technological developments are exploited in the commercial sector can the nation be certain that we are receiving the maximum benefit of the national scientific and technical resource that the federal laboratories embody. The increased integration of such a vast technical resource into the nation's economy will assist the nation in achieving the goal of enhanced economic productivity through technological innovation.

Ms. LLOYD. Thank you very much, Mr. Carpenter.

I want to applaud Martin Marietta for their dynamic efforts to really work for technology transfer in this area. If you remember, before the RFP's were actually drawn up by the Department of Energy, I talked to then-Secretary Hodell and asked him, please, that this was a once-in-a-lifetime opportunity, to please incorporate in the RFP's interaction between the universities and other areas of learning so that we could move this into what we call a very high tech corridor, which I think is a term that is overplayed. But I think that we do have such enormous potential here with the Oak Ridge Laboratory.

In referring to your class waiver that you are working for, what do you see as any real problems or impediments at this time?

Mr. CARPENTER. Well, of course, Mr. Constant mentioned two things that are of concern to the Department. I might say that——

Ms. LLOYD. I thought you might like to add something——

Mr. CARPENTER. I'm afraid I can't add any problems, Mrs. Lloyd. Really, I really don't see any fundamental problems.

Ms. LLOYD. Do you see any regulations or legislation that are helping or hindering at this point, that you would like to comment on?

Mr. CARPENTER. I believe that if we can get the substantial provisions of the patent rights that we have asked for, that the positive impact will be very great. It will be great enough that we won't even have to worry about counting jobs. The effect is going to be obvious to us. I believe that we can give the Government, if they give us the patent rights, that we can give them liability shields which we, of course, are asking for ourselves. We don't profit so we don't think we ought to be put in a position of liability. That we can put ourself in a position where we are well shielded from liability, and put the Government also in a position where they are well shielded from liability. In fact, we believe that we can give them better protection than they are receiving right now and have received on the 19 exclusive patent assignments that we have heard they have already made. So, we don't see that as any problem in being able to give the Government good protection, and in being able to offer a position which is free of conflict. We think that the proposition we have offered the Government really accomplishes that.

So I see no great impediment in terms of issues that should prevent us from being able to sign up.

Ms. LLOYD. Do you intend to apply for any individual waivers?

Mr. CARPENTER. Yes, ma'am, we have. We have applied for 31 individual waivers since we assumed the contract in April of 1984. And we redoubled these efforts when we saw the difficulty arising in our being able to get a blanket waiver. It is still our hope that those 31 requests can be acted upon expeditiously as individual waivers even in the interim of a resolution of the larger general patent——

Ms. LLOYD. In what areas are these individual waivers?

Mr. CARPENTER. They span—I have listed them for the record, Madam Chairman.

Ms. LLOYD. They are included, OK, thank you. I didn't——

Mr. CARPENTER. But there are, let me say, some that have tremendous, in our view, tremendous commercial potential, including a couple that have the potential of affecting basic industries in the United States. I might mention that nickel-iron aluminides is, we think, a super, super alloy that is going to be regarded as with very great commercial significance. That's one. Lead-iron phosphate glass, which could fall in one of the exception areas, depending on how we eventually identify the exception areas to a blanket waiver—we think that has very high potential applications.

Silicon carbide whisker-reinforced alumina will contribute to regaining a technology parity in the advanced ceramics area, regaining parity with the Japanese, we believe.

Ms. LLOYD. This is very impressive, and it will, as I said earlier, be made a part of the record of these hearings.

I want to ask you if you see any problem with conflict of interest as you plan to invest further in Oak Ridge technology?

Mr. CARPENTER. There are issues that we must remain sensitive to avoid conflict. I believe we are aware of them, for example, stating the reverse side of this, we see no reason why, simply because we operate and manage the facilities, we should be deprived of the same technology access as any other firm has to what takes place in Oak Ridge. And there are technologies that could be significant to our other corporate endeavors. But if we want those, let us say that they are licensable and patentable, and our aerospace guys in Orlando want them. If we think that that is the way of achieving the largest commercial penetration of that, we would describe that circumstance to the Department of Energy, excuse ourselves from negotiating the licensing placement, encourage DOE to further it, and we would expect to see royalties applied wherever they are appropriate.

So that would be a DOE decision to assign a technology that was developed in Oak Ridge under a licensing agreement to an aerospace arm of Martin Marietta. And we would expect to pay royalties just like anyone else, which was never true with Carbide, may I say. Even though they were restricted to asking for individual waivers, they got them royalty-free. We are not asking for that.

Ms. LLOYD. We know that Martin Marietta has many arms.

Mr. CARPENTER. Yes.

Ms. LLOYD. Do you have any commercial clients, besides Martin Marietta, that you would hope to develop a technology for, if you should get a waiver?

Mr. CARPENTER. Absolutely. As a matter of fact, you know, that is our concentration and our emphasis. We have many large, substantial commercial firms which have expressed interest in the technologies that are emerging from Oak Ridge, and they are more interested this year than they were last because they think the technology should be more accessible to them. We have conducted, we prenegotiated some licensing provisions with some of these firms, anticipating that some day we are going to have the patent rights that we are striving for.

Ms. LLOYD. Do you plan to exploit any of these technologies in this area?

Mr. CARPENTER. Yes, ma'am.

Ms. LLOYD. Would you elaborate on that, please?

Mr. CARPENTER. Sure. I mentioned earlier the Tennessee Innovation Center. That is a corporate investment that we made here. The Tennessee Innovation Center—a construction contract has been let for the facility. It will be located in the Oak Ridge Technology Park which represents another corporate investment that Martin Marietta has made in Oak Ridge. That Center is formed for the purpose of new business formations. They either have announced the formation or are in final negotiation stages of announcing the formation of ten businesses. Eight of them are based squarely on Oak Ridge developed technologies. None of them are patentable. None of them require licenses. So, it is as available to anyone else as it would be us. But we are trying to spark new company formations right here in the area, and the majority of those will be based on Government R&D.

Ms. LLOYD. Do you feel this gives you an economic edge over, for instance, Boeing or Goodyear?

Mr. CARPENTER. It shouldn't. It is quite true that we are better informed about the technologies that are taking place. You know, I mean, we have front row seats. We operate the facilities.

Ms. LLOYD. These are some of the concerns that the Congress has to face.

Mr. CARPENTER. Sure. It is equally as available and to the Westinghouses of the world and to the Boeings of the world as it is to us. And, you know, we are anxious to inform them about the technologies that are emerging and they will get just as good a crack at it as anybody else.

Ms. LLOYD. We are proud of the TIC, but what plans do you have to really use the national lab, the enormous technology base we have here, in the formulation of these new innovations?

What are the plans for including the lab?

Mr. CARPENTER. Well, the process——

Ms. LLOYD. In the formulation of the new business——

Mr. CARPENTER. You mean, perhaps, the employees?

Ms. LLOYD. That's correct.

Mr. CARPENTER. OK. Well, we have talked about this a great deal, Mrs. Lloyd. We have determined that we are willing to be a very understanding employer when it comes to encouraging some of our principal investigators to themselves associate themselves with new business formations. And we are going to—they, of course, have the technology information. So, often it improves our probability of success if the inventors themselves can be associated with the new enterprise formation, and we are encouraging our employees to consider this. And we are entertaining some arrangements which include giving them leave of absence, agreeing to their working in such a moonlighting effort, adjusting their work week in some cases, and really, really trying to help them help the new companies succeed. It gives us penalties——

Ms. LLOYD. I would certainly encourage you do it to make the most of the lab, which I think is a national treasure.

Mr. CARPENTER. Yes.

Ms. LLOYD. Thank you very much.

Mr. Morrison.

Mr. MORRISON. I was only going to ask one question. I am a believer in the profit motive, and your statement on behalf of Martin

Marietta certainly is fantastic from the point of view of taxpayers getting a return on investment.

You partially answered the one inquiry I was going to make. That is the incentives down to the individual. I mean, these ideas essentially are going to come from your team.

Mr. CARPENTER. Yes.

Mr. MORRISON. But my experience has been that usually there is one spark plug in that team that has the idea. And I read through your statement and have a fairly good feel for this. I mean, you start with lapel pins, and they belong to a forum, and this sort of thing, which doesn't go quite far enough. But now you have indicated encouragement to associate themselves with someone who might apply the technology; and that would be, of course, there would be professional reimbursement for that sort of opportunity. Is there more that could be done? Should others be following the example of some of these individual employee incentives that you have provided? You sent your leaders in this arena?

Mr. CARPENTER. Well, it is nice to have a new circumstance to be able to create out of whole cloth in a contemporary opportunity in the last 2 years. You know, it is a little more difficult for an established firm to change what he's done. We had the advantage of being able to say, hey, if you give us the Oak Ridge contract, here are some ways we'd try to behave.

So in that sense, simply because we are new on the scene and have the opportunity of establishing a new and original arrangement, perhaps we have been able to move a little more briskly than other established firms.

I did mention also, Mr. Morrison, that we are adopting procedures which would place our employees directly in the revenue stream. This is nontrivial financial reward.

Mr. MORRISON. This is from your pool of royalties?

Mr. CARPENTER. Yes, sir, right. And right now, you know, as we see that circumstance, we would give them 10 percent of the first $500,000 gross, you know, don't subtract out administrative support costs and stuff like that. Five percent above that——

Mr. MORRISON. Just taxes and that sort of thing——

Mr. CARPENTER. Just taxes, right.

Five percent above that, to a cap of $100,000 per invention, per employee. So there is the opportunity for a significant financial reward and financial participation by our employees.

Mr. MORRISON. I certainly commend you for that. I personally feel that that is one of the significant keys.

I'm impressed, Mr. Chairman, with what Martin Marietta has done with this responsibility and trust that whatever we do legislatively out of your subcommittee will enhance their opportunities.

That is the extent of my questioning.

Mr. WALGREN. Thank you, Mr. Morrison.

Now it does seem like there is a lot of energy here and you bring a lot to it individually. And we all know that that is what drives our system. And there is something here that we certainly should be trying to encourage to happen elsewhere.

What is in it for Martin Marietta, though?

I am curious——

Mr. CARPENTER. That is a frequently asked question, Mr. Walgren. It is just unbelievable that a profitmaking company would propose a program that has no profit potential for them, isn't it? But, really, we do have advantage potential for that. And that is, as Ms. Joseph mentioned, our job is to perform well under our management contract with the Department of Energy. If we perform well, we are graded well and our profit increases. This is one of the aspects.

Mr. WALGREN. What is the range of that profit increase?

Mr. CARPENTER. It can range—it is renegotiated every year. Under the award fee contract that we are operating right now, it can swing from $5-plus million up to a maximum extreme of $20 million. So, the swing based on our performance is $12, $14 million, something like that, significant even to us.

Mr. MORRISON. Would the gentleman yield?

Mr. WALGREN. I would be happy to yield.

Mr. MORRISON. Could we relate that figure back as a percentage of your total operating contract?

Mr. CARPENTER. Minuscule, as we drive off of the Department of Energy acquisition regulations, where fee curves apply, you know, we are out there where we'll cycle about $2 billion through, between $1.8 and $2 billion a year, through these facilities. And our profit potential is something under 1 percent of that, of which about two-thirds of our profit potential, the way we have it structured right now, relates to how well they feel we have done.

Mr. WALGREN. If the gentleman would yield. The potential fee increase would be quite free and clear of any cost. Is that right?

Mr. CARPENTER. That is correct.

Mr. WALGREN. So the measure of the fee increase would be against your, or the company's profit after tax of net income, if that is right, net income from the contract as a whole. Is it minuscule when measured against the net income, or the actual kept value by Martin Marietta, at that point?

Mr. CARPENTER. Investments, sir?

Mr. WALGREN. Well, no. I guess, I'm sorry I can't make myself clear. As I understand it, you have the potential of increasing your gain under the contract by $14 million, let's say——

Mr. CARPENTER. Approximately.

Mr. WALGREN. To a total of 20 million in technology transfer success.

Mr. CARPENTER. No, no. Well, that is in total at management of the contract, sir. Not just one factor. A significant factor of that but not an overwhelming factor is technology transfer. There are many other things that——

Mr. WALGREN. I see. The total management contract is——

Mr. CARPENTER. Yes.

Mr. MORRISON. If they do a good job overall——

Mr. WALGREN. As much as $20 million but as little as $5 million. Is that correct?

Mr. CARPENTER. That is correct.

Mr. WALGREN. I see. And then how much of that is reachable through performance on the technology transfer aspect?

Mr. CARPENTER. OK. Well, I think I can give you a pretty closely approximate figure. Right now, we are being graded under our per-

formance on technology transfer as a sub-element of the ORNL award fee. ORNL is one of several activities that we manage: ORNL, the weapons plant and the enrichment. This year, on the first 6 months' award fee, 25 percent—no, no, it was 10 percent of the total ORNL award fee was based on technology transfer. So ORNL is about 25 percent of our total award fee. So, you've got about $400,000 of profit to us that will swing based on how well we do in technology transfer. Not a large item, but significant to us.

Mr. WALGREN. When you say that swings, is there an upside and a downside in that to your balance sheet?

Mr. CARPENTER. Oh, yes.

Mr. WALGREN. Say 400,000 in profit, can that be greater?

Mr. CARPENTER. $400,000 would represent the maximum. If we do poorly, we get none of that in technology transfer. If we do well, as I might observe that we were graded superior on technology transfer in the first 6 months' period, and, so, we got all of that increment.

Mr. WALGREN. That is a retrospective grade——

Mr. CARPENTER. Yes, sir, it is.

Mr. WALGREN [continuing]. Created by——

Mr. CARPENTER. By the local Oak Ridge operations component of DOE; yes, sir.

Mr. WALGREN. And then you can renegotiate that component in the next year?

Mr. CARPENTER. Yes, that's right.

Mr. WALGREN. If there is something else that should be taken into account.

Mr. CARPENTER. That is correct.

Mr. MORRISON. If the gentleman would yield, I might add that this is a standard procedure. As I understand it, the great game for contractors working with the Department of Energy is to receive a high rating because it spins off in dollars.

I guess the only point that comes out of the responses from Mr. Carpenter to me is maybe that 10 percent weight applied to technology transfer should be made higher for the purpose of getting other contractors across the country to do an increasingly superior job of providing for technology transfer.

I will offer that to the chairman just as an idea that may not have any merit.

Mr. WALGREN. We are sort of looking at 2½ percent, is that right, of the——

Mr. CARPENTER. That is correct. The way it was structured the first 6 months, about 2½ percent of the total award fee, which measures many important aspects of our performance, of course.

Mr. WALGREN. I see. And the investor has up to $100,000, an individual—not the investor, the inventor has up to $100,000. That is very comparable to your total fee.

Mr. CARPENTER. Well, that doesn't come out of our profit, remember, Mr. Walgren. In other words, that money that we pay the inventor will come out of the revenue, the royalty revenue pools. The beauty of that is that it does not happen—it is additional money, it really doesn't cost us profit, and it doesn't cost the Government new expenditures. It comes out of the—his payment would directly come out of the revenue pool.