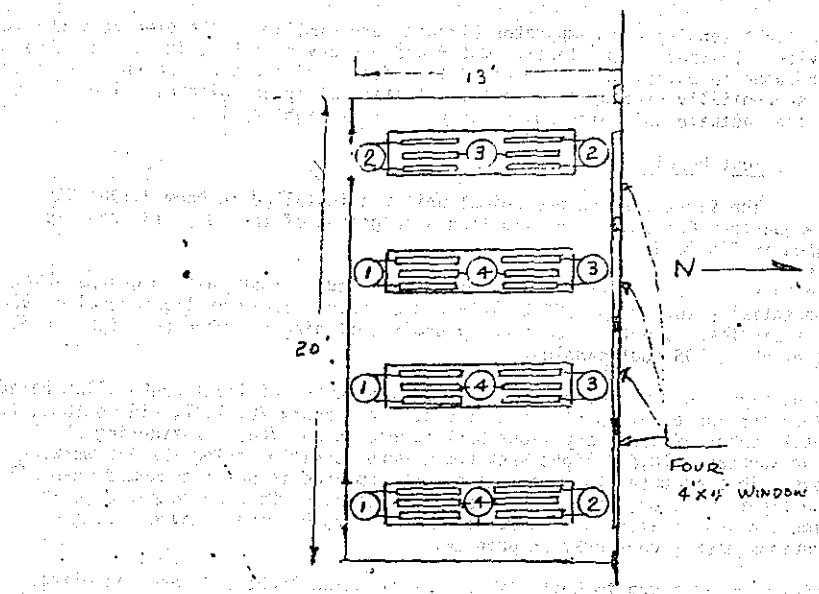
Mr. LLOYD. This committee will stand adjourned.
[Whereupon, at 12:30 p.m., the committee hearing was adjourned.]



NOTE: NUMBERS DENOTE SEQUENCE LAMPS ILLUMINATE WHEN OUTSIDE LIGHT BECOMES DIM. LIGHTS EXTINGUISH IN OPPOSITE SEQUENCE WHEN OUTSIDE LIGHT BECOMES BRIGHT.

FIG. 3 LIGHTING ARRANGEMENT FOR ROOM 3419 B HDQ BLDG, KSC.

The light sensing and comparator circuits are similar to the electro-mechanical device. Instead of an electric motor and mercury switches, it uses a pulse generator to establish the required time delay which causes the shift register to sequentially step up or down the actuation of Triac switches. The Triacs further actuate solenoids which carry the full lighting load.

V. Test Results

The first electro-mechanical unit was installed in Room 3419B, KSC Headquarters Building. The lighting arrangement of the 20' x 13' room is shown in Figure 3.

The 24 fluorescent 40-watt bulbs were connected in four uniform groups which sequentially turn on or off to maintain a minimum incident light level of 95 foot candles. Lights automatically begin switching off when the light level rises above 105 foot candles.

An hourly record was maintained showing the number of light banks illuminated. Since the installation of the controller on January 26, 1977, (15 months), the total number of hours any light bank turned on was 704. Considering 8½ hour workdays, 10,600 light bank hours were possible during the 310 working days. This amounted to a savings of 94% compared to power consumed when all the lights were on, however, the savings was only 90% when compared to the lighting levels after one third of the light bulbs were removed during a previous energy conservation program.

Desks were arranged to best utilize the incoming light and venetian blinds were fully raised. Work being performed in the office was both clerical and engineering. Workers have indicated complete satisfaction with both the room arrangement and the lights switching on and off automatically. During the 15 months of operation, the unit operated satisfactorily and did not require any adjustment or maintenance.

Prepared by

R. A. Sannicandro

DD-ESO PROGRESS REPORT

AUTOMATIC LIGHT CONTROLLER

I. Summary

An energy saving device to automatically turn on and off supplementary lights in rooms with window exposure has been designed, fabricated and tested under NASA/KSC contracts. The device senses the amount of light reflected from a selected area of the room and increases or decreases the artificial lighting to maintain a minimum pre-selected light level. Fifteen months after installing a unit in a 20' x 13' room facing north at KSC, the results showed a power saving of 90% compared to power normally used.

II. Introduction

In an effort to conserve energy, NASA/KSC embarked on a project to develop a method of automatically controlling the lights of perimeter offices by taking maximum advantage of daylight. The development resulted in the creation of two types of units; an electro-mechanical device and an all-electronic device. Both are constructed of off-the-shelf components and each appears to perform equally well.

III. Description of the Electro-mechanical Device

The electro-mechanical device consists of a power supply, a photo-electric cell, a dual voltage comparator integrated circuit, two transistors, two switching solenoids, and a bi-directional 1 rpm motor on whose shaft is mounted a disk with four mercury switches. The circuit diagram is shown in Figure 1.

The Cadmium Sulfide photo-conductive cell is strategically located inside the room to sense the reflected light level from a representative surface of the working area without becoming saturated by either the natural or artificial light. Changes in light levels cause the DC voltage level to vary linearly through the cell. The integrated voltage comparator circuit re-acts to these changes through its dual in-line amplifiers followed by two switching transistors and solenoids which energize the motor. Attached to the motor shaft are four mercury switches mounted on a disk which when rotated, sequentially switch light banks on or off. The required time delay (approximately 5 seconds) between switching is achieved by the rotational speed of the motorized disk.

IV. Description of the All-electronic Device

The all-electronic device consists of a power supply, a photo-electric cell, a dual voltage comparator integrated circuit, a pulse generator, a four bit bi-directional shift register and four Triacs. The circuit diagram is shown in Figure 2.

BALTIMORE ECONOMIC DEVELOPMENT CORPORATION, THE TECHNOLOGY COMMERCIAL-IZATION CENTER AND THE ECONOMIC DEVELOPMENT ADMINISTRATION.

IF HIGH TECHNOLOGY, AND IN PARTICULAR, ENERGY CONSERVATION TECHNOLOGY IS TO BE COMMERCIALIZED TO IT'S MAXIMUM POTENTIAL, IT IS IMPERATIVE THAT THE UNITED STATES GOVERNMENT TAKE A LEAD AND ASSIST SMALL BUSINESSES ENTER INTO THE MARKET PLACE REALISTICALLY, THROUGH THE USE OF IT'S PURCHASING POWER, AND THAT THE FEDERAL GOVERNMENT REMOVE THE UNNECESSARY ENCUMBRANCES OF THE SMALL BUSINESS.

MULTIPURPOSE BUILDING.

THESE DEMONSTRATION HAVE SHOWN A SAVINGS IN EXCESS OF SIXTY PERCENT OF THE ENERGY NORMALLY USED. WHEN THESE TEST ARE COMPLETE, AND THE DEMONSTRATION PROVES AT LEAST A FIFTY PERCENT ENERGY SAVINGS, AS EXPECTED, BASED ON PAST PERFORMANCE, BALTIMORE HAS AGREED TO RETROFIT IT'S SCHOOLS AND MUNICIPAL BUILDINGS WITH SOLARSTATS.

ONE OF THE NATIONS LARGEST BUILDINGS HAS AGREED TO THE INSTALLATION OF SEVERAL SOLARSTATS, TO DETERMINE IT'S ADAPTABILITY TO THE BUILDING'S EXISTING ENERGY CONSERVATION CONTROL SYSTEMS.

WWA HAS CONSISTENTLY ATTEMPTED TO PLACE SOLARSTATS IN VARIOUS GOVERNMENT INSTALLATIONS AND BUILDINGS. IN SPITE OF THE PROVEN ENERGY CONSERVATION SAVINGS FROM THE USE OF SOLARSTATS, MANY GOVERNMENT AGENCIES HAVE REFUSED TO USE THE DEVICE IN THEIR ENERGY SAVING PROGRAMS. TO DATE, NO NATIONAL GOVERNMENT AGENCY HAS INDICATED A SERIOUS INTEREST IN USING SOLARSTAT, AS A FORM OF ENERGY CONSERVATION. THE STANDARD REBUFF IS "WE'RE PURSUING OTHER METHODS OF ENERGY CONSERVATION".

A MAJOR PRODUCTION FACILITY FOR THE MANUFACTURING OF SOLARSTAT, AND OTHER ELECTRONIC DEVICES IS SCHEDULED TO BE OPENED IN THE CITY OF BALTIMORE, DURING EARLY SUMMER. THIS FACILITY WILL BE OWNED AND OPERATED BY WWA. THIS EFFORT IS BEING ASSISTED BY THE CITY OF BALTIMORE, THE

WWA IS PURSUING THE COMMERCIALIZATION OF THE LIGHT CONTROL DEVICE UNDER THE TRADE NAME OF "SOLARSTAT". DURING THE INITIAL ATTEMPTS OF WWA TO COMMERCIALIZE THE SOLARSTAT, THE COMPANY WAS INTRODUCED TO A MINORITY ENTERPRISE SMALL BUSINESS INVESTMENT CORPORATION (MESBIC). THE PURPOSE OF MESBIC IS PURPORTED TO BE TO HELP MINORITY BUSINESSES ENTER INTO THE MARKET PLACE. HOWEVER, OUR EXPERIENCE WAS THAT THE MESBIC, A PRIVATELY OWNED COMPANY, HAD THE OBJECTIVE OF GAINING ABSOLUTE CONTROL OF MINORITY INVENTIONS AND BUSINESSES, WITH FEDERAL FUNDS.

IT IS IMPERATIVE THAT THE CONGRESS TAKE A CLOSE LOOK AT "PRIVATE" MESBICs, TO PREVENT UNKNOWING INDIVIDUALS AND SMALL BUSINESSES FROM BEING SCURRILOUSLY PIRATED BY GOVERNMENT SPONSORED SUBVERTIVE ORGANIZATIONS AND INDIVIDUALS.

WWA WAS LATER DIRECTED TO THE TECHNOLOGY COMMERCIALIZATION CENTER, WHICH IS A BRANCH OF THE MINORITY SMALL BUSINESS DEVELOPMENT AGENCY, A BRANCH OF THE DEPARTMENT OF COMMERCE, WASHINGTON D.C. WITH THE ASSISTANCE OF DR. BUTLER, DIRECTOR OF THE CENTER, WWA HAS MADE CONTACT WITH SEVERAL LOCAL, STATE, FEDERAL AND COMMERCIAL ORGANIZATIONS AND AGENCIES. IT WAS THROUGH THIS OFFICE, THAT A DIALOG WAS ESTABLISHED BETWEEN THE CITY OF BALTIMORE, MARYLAND AND WWA. AS A RESULT OF THE INTRODUCTION, A DEMONSTRATION PROGRAM IS INSTALLED IN THE BALTIMORE SCHOOL SYSTEM AND A

CARL A. WARREN
WARREN AND WILLIAMS ASSOC., INC.
P. O. Box 5097
TITUSVILLE, FLORIDA 32780
(305)453-6334

PRESENTED TO; HOUSE SUBCOMMITTEE
ON OVERSIGHT
FEBRUARY 23, 1980

WARREN AND WILLIAMS ASSOCIATES, INC. (WWA) IS A MINORITY ENTERPRISE. THE COMPANY WAS FORMED IN 1976, FOR THE PURPOSE OF ENGAGING IN THE FIELD OF TECHNOLOGY RESEARCH, DEVELOPMENT AND MANUFACTURING OF HIGH TECHNOLOGY ENERGY EFFICIENT APPARATUSES. THE OBJECTIVE OF THE FIRM WAS, AND IS, TO UTILIZE IT'S RESOURCES FOR THE CREATION OF NEW TECHNOLOGY PRODUCTS WHICH WILL ADDRESS THE PROBLEMS IN THE FIELD OF ENERGY CONSERVATION.

A CONTRACT BETWEEN WWA AND NASA, KENNEDY SPACE CENTER WAS ENTERED INTO IN 1976, FOR THE DEVELOPMENT OF AN AUTOMATIC LIGHT CONTROL DEVICE. THE PURPOSE OF THE DEVICE WAS TO SAVE ENERGY, BY REDUCING ARTIFICIAL INTERIOR LIGHTING, PROPORTIONATE TO THE INCREASE OF THE INTERIOR'S EXPOSURE TO THE SUNLIGHT. THE DEVICE HAS BEEN DEVELOPED AND HAS BEEN TESTED BY NASA, KENNEDY SPACE CENTER. DURING A FIFTEEN MONTH EVALUATION OF THIS METHOD OF ENERGY CONSERVATION, AT NASA KENNEDY SPACE CENTER, NINETY PERCENT (90%) OF THE ELECTRICAL ENERGY NORMALLY USED, WAS SAVED.

NASA WAIVED THE RIGHTS TO THE PATENT ON THE APPARATUS BACK TO WWA, UPON THE RECOMMENDATION OF THE OFFICE OF TECHNOLOGY UTILIZATION. WWA HAS APPLIED FOR A PATENT, AND A PATENT IS PENDING.

We went into construction to a minority goal and to a large subcontracting program to get more than lipservice under the best efforts clause. We were not getting any positive responses and we think you will see more and more of this.

This law came into effect in October 1978 and NASA implemented it in June, and we were one of the first to do that, and, as you know, sir, there has been some pressure from Congress to get DOD and DOE on the stick.

Mr. LLOYD. Thank you very much.

This concludes our hearing for today.

I would like to take the opportunity not only to thank my colleague and friend, Bill Nelson, for providing this opportunity, and for doing a lot of the basic work but also to thank my staff who has, in my opinion, done a very outstanding job, and, certainly, we again have to acknowledge the presence of one of the members of that staff, Ray Brill.

I would like to thank Mr. Autry, Mr. Edwards, Mr. Scherer, Mr. Ivey, Mr. Searle, Mr. Humphrey, Mr. Cerrato, Mr. Thornton, and Mr. Lohse, and I would take this opportunity to thank all of you for joining us today. I hope sincerely that it has been as rewarding to you as it has been to us.

Mr. Nelson?

Mr. NELSON. I just want to note the presence of three people here in the room; my personal adviser on defense and space-related activities, Col. Ed Ramsey. I want to also note, in addition to Ed, the Commander of the Eastern Missile and Space Center, Colonel Burkland, and I want to also acknowledge his deputy, Colonel Jones and we appreciate you all arranging these fine facilities for congressional hearing. We appreciate that.

[The prepared statement of Mr. Warren follows:]

acquainted with one set, instead of flooding you with three. We are incorporating standard clauses by references so that that relieves the amount of paper, too. We have reduced our reports. We are not—in our financial data reporting. We are concentrating reports at the systems level rather than going down to what I call the nitpicking level.

Mr. NELSON. Is NASA headquarters in Washington doing the same thing?

Mr. LOHSE. Yes; the incorporation by reference is a NASA-wide program, incorporation of clauses by reference. Yes, sir.

Mr. LLOYD. One other thing is that—I would just be interested, and I know this afternoon we are going to have an opportunity to take a look at the Space Shuttle and some of these applications—I will at that time be asking you some questions which I may even incorporate in this hearing with regards to application of that technology, of the technology which will be carried into space, to small businesses, and how small businesses can participate more effectively, because it is a pretty expensive ball game to play in. If you have any thoughts on this, we will be talking to you this afternoon.

Yes, sir. We have another gentleman from the audience who would like to say a word.

Mr. SWENSON. Can I address, Mr. Lohse?

Mr. LLOYD. Sure.

Mr. SWENSON. Doug Swenson, Micro Processor Systems, Orlando, Fla.

In appendix 1 you differentiate between large business and small business prime awards, of the $25 million.

Now, is that construction, like construction of buildings or pads and stuff?

Mr. LOHSE. Yes; that is all construction in appendix I.

Mr. SWENSON. OK. Let's eliminate that.

What about in high technology?

Where does small business figures and high technology in Space Shuttles show up here?

Mr. LOHSE. We have very little in high technology because we just don't have any—many pure R. & D. dollars.

Mr. SWENSON. OK.

Second question. Does NASA, in some way, coordinate on the prime awards for systems and technology programs, like communication, or whatever a prime award is—say there was Martin Marietta or a large company like that—does NASA coordinate subcontracts to those prime contractors in their programs or do you do anything to foster the prime contract going to the small businessman for some of these subcontracts?

Mr. LOHSE. For the past, oh, 3 or 4 years we have had a best efforts clause that told our major prime to use small business and disadvantaged concerns.

Now, under Public Law 95–507, we, on any contract we lend over $500,000, we get a small business and disadvantaged concern utilization plan and we review it, in conjunction with the Small Business Administration, and it must show us what business, what kind, and how much is going to which category, and it will now produce more positive results than the best effort one.

Mr. LLOYD. Thank you very much, Mr. Lohse.

Mr. Nelson?

Mr. NELSON. What is the demand light regulator? Was that the one that was awarded to Carl Warren?

Mr. LOHSE. Yes. Yes.

Mr. NELSON. I saw Carl in here a while ago.

Mr. LOHSE. Carl is here.

Mr. NELSON. There he is.

Now, as it has been brought out in previous testimony, he got the opportunity to develop that through you all, but then he has had subsequent problems in marketing that commercially.

Isn't that right, Mr. Warren?

Mr. WARREN. Right.

Mr. LLOYD. Would you identify yourself so that lady can hear you.

Mr. WARREN. I am Carl Warren, Warren & Williams Associated. We have had difficulty in marketing it. We have overcome quite a few of them, merely by hard work, to tell you the truth, and I find, maybe, I am just not sophisticated enough to go the realm of some other people.

We took the direct method, and, as the general marketing program has picked up, it is unfortunate we haven't been able to market to the Federal Government where it was tested; but we have found some State and local government and private industry where we are now doing installation. We are getting ready to process.

In fact, we are opening up a plant up in the Baltimore area to manufacture, to mass produce these devices, which is the electronic device.

Mr. NELSON. Is yours, by the way, a competitive product to George Humphrey's?

We are talking about a device that will regulate light in a room.

Mr. WARREN. Yes.

Mr. NELSON. Is it in competition to yours?

Mr. WARREN. Right.

Mr. NELSON. Let me ask you this, Bill. You said that last year KSC's total expenditure for R. & D. was only $1.4 million.

What was that used for?

Mr. LOHSE. We had about four procurements. One of them was to identify—pardon me a moment.

Mr. NELSON. Just tell me at lunch. I just want to be familiar with it.

Mr. LOHSE. Part of them were—is a hypergolic area and that type of scientific research on sniffing toxic detectors in that area.

Mr. NELSON. OK.

Mr. Chairman, just one more question.

Now, Bill, you are in a unique position. We have heard testimony from everybody dealing with the Government that says there is excessive paperwork that needs to be given personal attention and so forth and so on. You are in a uinque position to do that.

Now, I heard what you said about you are trying to do this. Are you really making any progress?

Mr. LOHSE. Well, we made some. Instead of flooding everybody with hundreds of invitations for bids and our request for proposal clauses, we are using a streamline system, where you only have to be

NAS10-9489 $ 10,000

Management Analysis Center, Inc.

Identification & Analysis of Economic Impact of Reimbursement for Spacelab Services provided to Non-U.S. Government Users.

NAS10-9492 $ 96,833

Energetics Sciences, Inc.

Toxic Level Hypergolic Vapor Detection Sensor Development-
Note: $162K add-on pending

NAS10-9374 $399,584

J. H. Wiggins Co.

Space Shuttle Hazards Analysis Study
Note: Addition $22.5K add-on pending

CC-80179A & 82279A $ 19,782

Lighting Technologies Inc.

Development of Utilization Data for Lighting Detectors

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SMALL AND DISADVANTAGED BUSINESS UTILIZATION PROGRAM
NEW RESEARCH AND DEVELOPMENT CONTRACTS

Fiscal Year 1979

Installation	Total Business	Small Business	Percent of Total Business
NASA TOTAL	$175,642	$21,086	12.0
Ames	17,073	4,577	26.8
Dryden	1,858	360	19.4
Goddard	52,402	2,317	4.4
Headquarters	1,651	662	40.1
Johnson	18,183	2,665	14.7
Kennedy	1,432	-	-
Langley	29,382	2,604	8.9
Lewis	38,143	5,976	15.7
Marshall	15,166	1,770	11.7
NSTL	-	-	-
Wallops	352	155	44.0

This table reports small business participation in NASA's new research and development activities by installation. The report is limited to reportable awards (NASA Form 507), generally of $10 thousand or greater, and to new contracts let during this fiscal year.

DOLLARS IN THOUSANDS

NASA/K

KSC'S SMALL BUSINESS PROGRAM

1st QUARTER FY 80

TOTAL OBLIGATIONS BY KSC	$83,753,000
TOTAL OBLIGATIONS ON EXISTING LARGE BUSINESS CONTRACTS	70,965,629
DIFFERENCE (MONEY AVAILABLE TO SBS)	12,787,371
$ & % to SMALL BUSINESS	6,999,000 (55%)
$ & % to LARGE BUSINESS	5,788,371 (45%)

Appendix 5

SET-ASIDE AWARDS
TO
SMALL AND DISADVANTAGED BUSINESS

Total Dollar Awards in FY79#	
Langley	$28,790
KENNEDY	18,189
Johnson	15,851
Lewis	10,164
Marshall	7,351
Ames	6,994
Goddard	5,930
Wallops	2,758
NSTL	1,245
Dryden	1,190
NASA HQ	940
Total	$323,668

$ in thousands

% of Total FY 79 Business Set Aside	
Langley	14.6%
Wallops	14.6
KENNEDY	5.6
Dryden	5.6
Ames	4.3
NSTL	3.9
NASA HQ	3.8
Lewis	3.8
Johnson	1.4
Goddard	1.2
Marshall	1.0
NASA Avg.	2.9%

Cumulative Awards Under Section 8(a)*	
Goddard	$43,078
Ames	37,049
KENNEDY	23,270
Marshall	21,199
Langley	15,930
Johnson	14,779
Dryden	12,027
Lewis	9,414
NASA HQ	7,367
Wallops	5,180
NSTL	362
Total	$189,655

* Since inception of the Section 8(a) Program in June 1970

KSC 8(a) PROGRAM

	GOAL	ACTUAL
FY 79	$3.9M	$3.983M
FY 78	3.4M	4.492M
FY 77	2.75M	2.852M
FY 76	2.8M	2.565M
FY 75	2.5M	2.664M

Appendix 3

KSC AWARDS TO SMALL BUSINESS

	$	GOAL	ACTUAL
FY 79	37.33M	8.6%	11.6%
FY 78	30.83M	9.8%	14.6%
FY 77	39.64M	9.0%	18.6%
FY 76	20.16M	11.9%	12.7%
FY 75	15.91M	8.6%	11.9%

Appendix 2

SUBJECT: Report of Minority Subcontracting on Space Shuttle Construction, Kennedy Space Center, January 1975 - September 1979

	Value
Total Prime Awards	$160,473,281 (36 contracts)
Large Business Prime Awards	134,494,683
Small Business Prime Awards	25,978,598
Small Business Prime Awards % of Total Prime	+16.2%
Total Subcontracts	$110,979,081
Small Business Subcontract Awards	64,683,682
Small Business % of Prime	40.3%
Small Business % of Subs	58.3%
Minority Business Subcontract Awards	$ 26,342,020
Minority Business % of Prime	16.4%
Minority Business % of Subs	23.7%
Small Business Prime and Subcontract Awards	$ 91,025,702
Small Business Prime and Subcontract Awards % of Total Prime Awards	56.7%

This table reports the current status of the minority business subcontracting effort at KSC with the contractually established 20 percent minority subcontracting goal.

(K) 10/11/79

APPENDIX 1

One example of KSC's assistance in the R&D area to a small disadvantaged firm resulted from a "demand light regulator." This device was invented by a KSC engineer, and through our small business specialist, a small contract was given to a minority owned firm to develop the concept. The firm has now been licensed to market the device and is selling to GSA, bank buildings, municipalities, and other sources. It appears to be a future success financially for them. The firm could not obtain funds through KSC's TU Program due to our lack of funds; therefore, they had to borrow from commercial sources.

Appendix 7 lists some study contracts awarded small business which totals $526,199. Also, our personnel advise small business prospects on all aspects of the small business and disadvantaged business programs and direct high technology firms to the other centers that may have a need for the firms' expertise and/or to NASA Headquarters. We have a comprehensive instructive publication explaining clearly NASA's procurement policies. We provide a copy to all prospective bidders/ proposers.

KSC procurement and technical personnel have presented many programs and seminars in cities such as Miami, Jacksonville, Cocoa, St. Petersburg, etc. to advise and instruct prospective bidders on how to bid on our contracts. Seminars will be considered for future presentation when it appears they will be beneficial to the small business community.

Mr. Chairman, this concludes my statement. I will be pleased to answer any questions you may have.

HOLD FOR RELEASE UNTIL
PRESENTED BY WITNESS

STATEMENT OF

MR. WILLIAM M. LOHSE

DIRECTOR, PROCUREMENT, SUPPLY & TRANSPORTATION

JOHN F. KENNEDY SPACE CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

Mr. Chairman and Members of the Subcommittee:

I appreciate this opportunity to appear before the Subcommittee to discuss the Kennedy Space Center's Small Business Programs. Mr. Jack Dryer, KSC's Small Business Specialist, is here with me. KSC is proud of its small business and minority programs for services, construction, and supplies. In 1979, KSC awarded $37.33 million to small business firms which was 11.6% of our total awards.

Our awards to small disadvantaged business firms in 1979 reached almost $4 million. This was accomplished through the 8(a) Program which now totals $23 million of KSC awards since the inception of the program in June 1970.

In addition to awards through the 8(a) Program, we also awarded over $1 million in direct competitive awards to minority owned firms during FY 79.

In the same time period, KSC ranked second of NASA centers in total set-aside dollars to small business and third in total dollars to small disadvantaged firms through the 8(a) Program.

We are particulary pleased with our construction subcontract program over the last few years. Appendix 1 gives a breakdown of this program which shows that over $91 million or 56.7% of KSC construction dollars went to small and/or disadvantaged firms. The attached charts give the breakdown of our small and disadvantaged business programs for past years.

Since KSC has been designated as an operational center, it is not directly involved with R&D or high technology programs except in very limited circumstances. Last year KSC's total expenditure for R&D programs was only $1.4 million. For this reason, this Center has concentrated its efforts towards small and minority business programs on services, construction, and supplies.

We also have awarded study contracts to small businesses of about half a million dollars a year, and one of our most important functions is advising personnel of small business about business prospects doing business with Kennedy Space Center and NASA. In the case of a high-technology company, we refer them to the centers or the headquarters, program office that is conducting that type of program.

As a result of 95–507, we have expanded our efforts and we are trying to help reduce paperwork and legal fees because we will explain the laws, the causes and the various regulations that pertain to the procurement that we have underway.

In addition, we have had many and conducted many seminars—Miami, Jacksonville, Cocoa—with both procurement and technical personnel to help small and disadvantaged communities participate in our program. We do this on a year-to-year basis and will continue it.

Mr. Chairman, this concludes my statement and I will be pleased to answer any questions you may have.

[The prepared statement of Mr. Lohse follows:]

Mr. LLOYD. I have a question on that, but I will come back to it. I think you might be thinking about it, and, that is, how do you get away from what I call the media cheap shot on some of these projects? You are aware, I'm sure, of the problem we have had with the National Science Foundation concerning some areas of basic research.

Mr. CERRATO. I don't really understand the question. Could you repeat it?

Mr. LLOYD. Have you had any problems with the media in regards to the grants that you are making or the areas of study at the universities?

Mr. CERRATO. No. Absolutely not.

Mr. LLOYD. They will get around to you. Give them time.

STATEMENT OF WILLIAM M. LOHSE

Mr. LOHSE. I am Bill Lohse, Mr. Chairman. It is a pleasure to be here. I would like to discuss the Kennedy Space Center's small business programs with you. I have brought along Jack Dryer, our small business specialist. KSC is proud of its small business and minority programs for services, construction, and supplies. In 1979 we awarded over $370 million to small business firms which was 11.6 percent of our total awards.

Our awards to small disadvantaged business firms in 1979 reached almost $4 million. This was accomplished through the 8(a) program and our total, since we got into the program in 1970, is approximately $23 million.

In addition to awards through the 8(a) program, we also awarded over $1 million in direct competitive awards to minority owned firms during fiscal year 1979.

In the same time period, Kennedy was second in NASA centers in total set-aside dollars to small business and third in total dollars under the 8(a) program.

We are particularly pleased with our construction subcontract program over the last years. We were about the second agency to embark in this are and we set a goal from about 20 percent of our subcontracts in construction for minority concerns and between minority concerns and small business, over 56 percent of our Shuttle construction—that is a $160 million program to date—of $91 million has gone to small businesses and disadvantaged concerns.

Since KSC is an operational center, we are not directly involved with R. & D. or high technology programs, except in very limited circumstances. For example, last year our pure R. & D. research amounted to about $1.4 million. For this reason, we have concentrated our efforts toward small and minority business programs on services, construction, and supplies.

We do have an interesting example we heard about earlier and that is the demand light regulator, wherein a small business firm and a minority firm both have had a license and we waived our rights to this Government patent, Government-held patent, developed by KSC engineering, so that they can develop and market the item. Both firms are licensed to market the item and they are being sold to GSA, bank buildings, municipalities.

EXAMPLES OF KSC INNOVATIONS RECEIVING MOST INQUIRIES

	No. of Inquiries
Ocean Thermal Plant	410
Implantable Hearing Aid	302
Artificial Limb Connector	224
Telephone Multiline Signaling System	207
Fiber Optic Cross-Bar Switch	199
Penetrating Fire Extinguisher	169
Handle for Spray Can Extension	123
Continuous Sterilization of Plumbing Systems	108
Fluidic Oscillator Gas Analyzer	104
System for Monitoring Lightning Strikes	104

1978 Provided a small telephone manufacturing and repair company information on an injection molding process that would allow them to manufacture a football-shaped telephone.

2-3-80 Providing the Prosthetic Service for Restorative Dentistry, Inc., of Ft. Lauderdale information on ceramic materials that could be used instead of precious metals in dentistry.

10-12-78 Provided the Cryonics Institute, Oak Park, MI, with information on Optimizing Insulation Weight on Cryogenic Storage Tanks.

10-27-78 Provided information to an author writing a childrens book on lasers.

12-12-78 Provided ITI Electronics, Inc., information on a combined PAM/PCM Audio Switching System for telephone communications.

12-19-78 Provided Project Outbound, Lake Worth, FL, information on space benefits in the field of physical handicaps.

5-25-79 Provided a college student with information on KSC medical research to assist him in obtaining information for a class paper.

6-1-79 Provided information to the City of Great Falls, Montana, on fire fighting, emergency plans, inventory control, personnel management, etc.

9-6-79 Provided information to a writer for Radiant Editions who is preparing a book on infrared photography.

10-16-79 Provided a Lebanon, CT, high school teacher with information on how technology from the space program is being utilized by non-space fields.

1979 Provided information to the Melbourne Kidney Center, Melbourne, FL, with information on how to improve the treatment of water to be used in the dialysis machines.

1979-80 Demonstrated to citrus growing managers the value of infrared aerial photography in citrus grove management.

1-29-80 Provided a New Smyrna Beach woman information on "Technologies for the Handicapped and the Aged."

1-30-80 Provided the Electric Power Research Institute information on hardware/software concepts to check out malfunctions in nuclear power plants and provide automatic shutdown.

1979 Provide the Gerald Price grave location business with information on equipment that would assist in grave location operations.

EXAMPLES OF ASSISTANCE PROVIDED TO
SMALL BUSINESS, SCHOOLS, AND STATE AND LOCAL GOVERNMENTS

1973-76 Assisted Brevard County Health Department to map underwater grass beds in county rivers.

1973-75 Assisted the Florida Game and Fresh Water Fish Commission in mapping vegetation in the Lake Washington area.

1978 Assisted the City of Palm Bay in making "Land Use Maps" of the city.

2-7-78 Provided the Bently Nevada Company with information on Micro-programming for Real Time Data Acquisition.

2-10-78 Provided a University of Florida man with information for a term paper on home computers.

2-22-78 Provided a Merritt Island man with information on Apollo Thermal Protection Subsystems.

3-2-78 Provided information to a Gainesville man on a tool for equal-izing cable tensions in elevator and crane cable systems.

3-9-78 Provided an author of a book on benefits that have come about as a result of the space program with 5 booklets of information.

5-10-78 Provided the Florida Power Corporation with information on the Lightning Current Detector.

9-12-78 Provided the Reliance Electric Research Center with information on "Spotting Small Liquid Leaks."

9-13-78 Provided the Hudson Oxygen Therapy Company with out tech brief on "Contamination Monitoring of Fluids."

9-22-78 Provided Broward County Courthouse Archives and Minutes Division information on freeze drying their records in the event of water damage.

10-12-78 Provided the Wright Line Computer Accessories Company with information on Program Audits.

Technology Transfer Methods

Technology Transfer takes on a multi-faceted role. Some examples follow:

1. Cooperative projects:
   a. Technical project management of the "Density Measuring Device" for USDA SCS.
   b. Demonstration of lightning, in clouds for the FAA use in aircraft routing, using the Lightning Detection and Ranging System at KSC.
   c. Corrosion Control Handbook for Mass Transit Systems, co-sponsored by Urban Mass Transit Administration; NASA, and DOD will be used for the first time in Miami.
   d. Lightning Current Monitor used by Department of Energy and others to instrument lightning strikes.
2. Demonstration of technology:
   a. Visits to KSC to demonstrate expertise which would be difficult to find otherwise, such as lab techniques, medical X-ray reading for high resolution capability, etc.
   b. Speaking engagements by trained experts in failure analysis techniques, energy, electronic systems, etc.
   c. Manuals and papers written on technology, criteria, standards, etc.
3. Dissemination of technology by contact:
   a. Speaking engagements
   b. Public sector working relationships, etc.
   c. Professional organizations
   d. Professional meetings
4. Transfer of technology by cross-fertilization in job related projects

New England Research Application Center (NERAC)
Mansfield Professional Park
Storrs, Connecticut 06268

Daniel Wilde, Ph.D., director
Phone: (203) 486-4533

North Carolina Science and Technology Research Center (NCSTRC)
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Research Triangle Park, North Carolina 27709

Peter J. Chenery, director
Phone: (919) 549-0671

Technology Applications Center (TAC)
University of New Mexico
Albuquerque, New Mexico 87131

Stanley Morain, Ph.D., director
Phone: (505) 277-3622

Western Research Applications Center (WESRAC)
University of Southern California
University Park
Los Angeles, California 90007

Robert Mixer, Ph.D., acting director
Phone: (213) 741-6132

Kerr Industrial Applications Center (KIAC)
Southeastern Oklahoma State University
Durant, Oklahoma 74701

Robert Oliver, Ph.D., director
Phone: (405) 924-0121, Ext. 413

State Technology Applications Centers

NASA Florida State Technology Applications Center
State University System of Florida
311 Weil Hall
Gainesville, Florida 32611
Ron Thornton, Director
Phone: (904) 392-6626

NASA/University of Kentucky State Technology Applications Program
University of Kentucky
109 Kinkead Hall
Lexington, Kentucky 40506

William R. Strong, manager
Phone: (606) 258-4632

COSMIC

112 Barrow Hall
University of Georgia
Athens, Georgia 30602

Harold G. Hale, Jr., director
Phone: (404) 542-3265

NASA Biomedical Application Teams

Research Triangle Institute
Post Office Box 12194
Research Triangle Park, North Carolina 27709

Doris Rouse, director
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Stanford University School of Medicine
Cardiology Division
Biomedical Technology Transfer
701 Welch Road, Suite 3303
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Advisory Center for Medical Technology & Systems
University of Wisconsin
1500 Johnson Drive
Madison, Wisconsin 53706

William N. Fetzner, Ph.D., director
Phone: (608) 263-2735

NASA Technology Application Teams

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Washington, D.C. 20036

Tom Smith, acting director
Phone: (202) 452-7700

SRI International
333 Ravenswood Avenue
Menlo Park, California 94026

Tom Arvos, Ph.D., director
Phone: (415) 326-6200, Ext. 2864

IIT Research Institute
10 West 35th Street
Chicago, Illinois 60616

Edmund R. Bangs, director
Phone: (312) 567-4191

NASA Field Centers

Ames Research Center
National Aeronautics and Space Administration
Moffett Field, California 94035

Technology Utilization Officer: *Charles C. Kubokawa*
Phone: (415) 965-5554

Hugh L. Dryden Flight Research Center
National Aeronautics and Space Administration
Post Office Box 273
Edwards, California 93523

Technology Utilization Officer: *John C. Drane (acting)*
Phone: (805) 258-3311, Ext. 787

Goddard Space Flight Center
National Aeronautics and Space Administration
Greenbelt, Maryland 20771

Technology Utilization Officer: *Donald S. Friedman*
Phone: (301) 344-6242

Lyndon B. Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas 77058

Technology Utilization Officer: *John T. Wheeler*
Phone: (713) 483-3809

John F. Kennedy Space Center
National Aeronautics and Space Administration
Kennedy Space Center, Florida 32899

Technology Utilization Officer: *Raymond Cerrato*
Phone: (305) 867-2780

Langley Research Center
National Aeronautics and Space Administration
Langley Station
Hampton, Virginia 23665

Technology Utilization and Applications Programs Officer: *John Samos*
Phone: (804) 827-3281

Lewis Research Center
National Aeronautics and Space Administration
21000 Brookpark Road
Cleveland, Ohio 44135

Technology Utilization Officer: *Paul Foster*
Phone: (216) 433-4000, Ext. 6422

George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Marshall Space Flight Center, Alabama 35812

Director, Technology Utilization Office: *Aubrey D. Smith*
Phone: (205) 453-2224

NASA Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103

Technology Utilization Officer: *John C. Drane*
Phone: (213) 354-6420

Wallops Flight Center
National Aeronautics and Space Administration
Wallops Island, Virginia 23337

Technology Utilization Officer: *Gilmore H. Trafford*
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Regional Remote Sensing Applications Centers

National Space Technology Laboratories
Earth Resources Laboratory
1010 Gause Boulevard
Slidell, Louisiana 70458

Director, Southern Regional
Remote Sensing Applications Center: *Roy Estess*
Phone: (504) 255-6472

Goddard Space Flight Center
Greenbelt, Maryland 20771

Head, Eastern Regional
Remote Sensing Applications Center: *Philip Cressy*
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Ames Research Center
Moffett Field, California 94035

Chief, Technology Applications Branch: *Dale Lumb*
Phone: (415) 965-5900

NASA Headquarters
Technology Transfer Division
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Washington, D.C. 20546

Manager, Regional Remote
Sensing Applications Program: *Richard H. Weinstein*
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Industrial Applications Centers

Aerospace Research Applications Center (ARAC)
1201 East 38th Street
Indianapolis, Indiana 46205

E. G. Buck, director
Phone: (317) 264-4644

Knowledge Availability Systems Center (KASC)
University of Pittsburgh
Pittsburgh, Pennsylvania 15260

Allen Kent, acting director
Phone: (412) 624-5211

SMALL, HIGH TECHNOLOGY FIRMS AND INNOVATION

FRIDAY, MARCH 21, 1980

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
Albuquerque, N. Mex.

The subcommittee met, pursuant to notice, at 9:30 o'clock a.m., in the Room Picuris, Albuquerque Conventon Center, 401 Second Street, the Hon. Jim Lloyd (chairman) presiding.

Present: Representatives Lloyd (California), chairman; Lujan (New Mexico), and Roth (Wisconsin).

Also Present: Ray Brill, counsel; Jerry Staub, staff director, and Dick Hapke, technical assistant.

Mr. LLOYD. Good morning.

We are very pleased to be here this morning to discuss a very important subject for all of us, small, high technology firms and innovation.

I am particularly pleased to be here with my colleague, Manual Lujan, whom I am sure all of you know, and Toby Roth, who hails from Wisconsin.

I am particularly happy to be in Mannie's district.

This is the fourth field hearing on this important topic and Congressman Lujan has been very active and a valued participant in this committee.

I want to thank him personally both for his expert work and the hospitality which he has extended to this committee.

We have had a series of hearings on this subject which discusses the issues of small, high-technology firms and innovation. We have had hearings in Appleton, Wis., Long Island, N.Y., Patrick AFB, Fla., and our final hearing will be in Pomona, Calif. We are looking forward to the testimony today. I understand we have some very exciting witnesses. In order not to take up too much of their time, I think we will move along.

I would like to take this opportunity to once again thank you, Mannie, for the opportunity to be with you.

I will turn the microphone over to my colleague from New Mexico.

Mr. LUJAN. Thank you.

I simply want to take just a minute or so to thank both you and Toby for coming to New Mexico this year.

Interestingly, hearings are tailored to the particular area where we are holding the hearing. In this hearing we are approaching the technology in the gasohol area because of the interest here. Of course,

with the large number of solar technology firms in the area and the potential for solar technology in this area, it is very appropriate that we have those kinds of hearings here.

I just want to make one point that sometimes unexpected thoughts seem to come out. We have talked about a technology transfer, and, after all, that is the purpose of the hearings all over, but one of the things that came out in our hearings in New York demonstrated how the Government can help this technology to move out into the market. It seems like when we start talking about tax credits on solar, for example, which was the example given, then the solar market kind of dries up. People start waiting until the tax credit is passed. Once it is passed, then it really accelerates. It is just kind of an interesting sideline that came as to how government can participate and push this technology ahead.

I don't want to take up any more time. I had some very brilliant things I wanted to say this morning before my constituency, but I just want to thank both you and Toby for taking time to come here.

Mr. LLOYD. Thank you very much.

Mr. Roth?

Mr. ROTH. Mr. Chairman, I thank you. I also want to thank Congressman Lujan for inviting us to come to his district. Last night when we came in, and I think you will agree, it was a beautiful setting as you come in from the airport to the city.

Mr. LLOYD. If we could just can the air and take it back to Los Angeles.

Mr. ROTH. Yes; I agree.

We had a very interesting hearing in Appleton. From that hearing I have been working on legislation to dovetail in some of the things we have learned. I intend, and I am sure all of us do, to learn a great deal here today. I think this will help us on the floor and in debate and also in working on the legislation.

I came to Congress a little better than a year ago. I came and I looked at the people that were on my committee and tried to memorize their faces. The reason I bring that up is because the first time I had an opportunity to meet Mannie Lujan was when he walked on the floor one day and I was sitting beside one of the older Congressmen and I asked, "What is that Lujan like?" He said, "Well, he is a hard worker, he knows his legislation, he is honest, but I want to warn you about one thing, though, never play poker with him."

It is nice to be here today with you, Mannie.

Mr. LUJAN. Thank you.

Mr. LLOYD. With that, we will commence with the witnesses. We will start with Mr. Jesko, then Mr. Loll, then to Mr. Diluzio.

Rudy, thank you very much for joining us this morning. I presume you have a prepared statement and if you wish to paraphrase any of that or make any changes, feel free to do so and we will accept your written statement for the record without objection.

You have the floor.

STATEMENT OF RUDY JESKO

Mr. JESKO. Mr. Chairman, I am only here maybe as a grassroots type person. We are interested in building a plant and we have run across

lots of problems trying to get these things funded. The grassroots end of it, which is what we are looking at, is our big problem. We can't get by all the laws and regulations that have to be complied with to build this. So we are just interested this morning in trying to find out where, when, how, who, and what to do about it. Really, that is all I know that I am here for.

Mr. LLOYD. Let's talk about your plant, then. What is it that you are interested in, what kind of a plant are you talking about?

Mr. JESKO. We are interested in grain alcohol. We have a lot of wastes on our farms that we could put into grain alcohol.

Mr. LLOYD. What kind of grains are you working with?

Mr. JESKO. Corn, maize, wheat, barley. We also feed cattle and, of course, the feed end of the alcohol plant is interesting to us. We utilize the feed as much as we do the alcohol.

Mr. LLOYD. In other words, what you want to do is to make a mash for alcohol and then after you have extracted or made the alcohol you then intend to use the residue as a feed for cattle; is that correct?

Mr. JESKO. Yes, sir, that is right.

The feed end of it is almost as important. We are in the feeding business and we think that is as important as the alcohol. Gasohol will be something we have to have. We are having trouble today getting fuel right now.

Mr. LLOYD. In other words, what you want to do, then, is not only make the alcohol, but you want to use the alcohol as a fuel on the farm so that it goes into the total cycle of operation, is that correct?

Mr. JESKO. Yes, sir. Of course that makes it a lot more feasible economically to do that. We have two products that are ready and available instantly that we can utilize.

Mr. LLOYD. What are the products?

Mr. JESKO. The feed end of it and, of course, the fuel end of it. We utilize a lot of fuel.

Mr. LLOYD. Can you use alcohol directly in your farm equipment or do you have to make some changes?

Mr. JESKO. No, sir. In our gasoline makeup we can use it directly, but we need an injection system to use it in our diesel pumps, but that can be done.

Mr. LLOYD. You use straight alcohol in a diesel?

Mr. JESKO. No, sir, not in a diesel. It has to be injected and used in combination.

Mr. LLOYD. With the diesel fuel, what are the percentages, do you know?

Mr. JESKO. You can go up as high as 50, 60, 70 percent in diesel. There are experiments being done today as high as 100 percent. You can go that high today without any problem. There is no major problem to converting a diesel engine to alcohol.

Mr. LLOYD. What do you have to do, change the injector nozzles?

Mr. JESKO. Yes, sir, because diesel and alcohol don't mix and you have to inject it separately. All that system is is just a different way of injecting, which is easy to do, just pumps and a different tank. Simultaneously it goes in and burns it without any major overhaul to the engine.

Mr. LLOYD. Thank you very much.

Mr. Lujan?

Mr. LUJAN. Mr. Jesko was asked to the hearing today because he is probably the classic example of what can be done in alcohol fuels today. They operate, I believe, 10 irrigation pumps.

Mr. JESKO. Twenty-one.

Mr. LUJAN. Twenty-one irrigation pumps and they can use the alcohol fuel right there. The feed, I am told, you don't lose very much. As a matter of fact, it is enhanced in protein value. You would do that just for the food value. If you threw the alcohol away, it would still be worth compacting it.

Mr. LLOYD. Say that again. You are saying that you lose no food value in the mash after you have extracted or made the alcohol, so you really don't give anything up other than the work energy that you use to make the alcohol?

Mr. JESKO. The feed value lost is maybe 10, 11 percent. That is according to what you lose. There are a lot of feedstocks you can utilize. With sweet sorghum you lose 10 or 11 percent, but with corn you maintain the same feed value. Alcohol is just a byproduct of the feed. You do not lose any feed value.

Mr. LUJAN. One more point, but I think that in looking at legislation, and we are trying to address that really, Rudy has two problems. One, of course, is the legislation.

We are trying to address that, Rudy.

Rudy has got two problems. One, of course, is the regulations of the AFT in being able to get a permit to operate a plant. Second, the financing because banks still consider it kind of risk capital so it is difficult to go out and get money. We are working on that, Rudy, to where we can change the regulations for denatured alcohol for fuels, and, second, there is legislation for as much as $3 billion to help in the financing of such projects.

I think that during this coming year that we will address those two points and I think that that is really what we need to do.

Mr. JESKO. Well, Congressman, that is our biggest problem, of course. There are people ready to build these plants, but there is no money available. You hear about it on radio and TV, but where is it, who has it, how can you get it, when can you get it?

Mr. LUJAN. Thank you, Rudy. Thank you for being with us today.

Mr. LLOYD. Mr. Roth?

Mr. ROTH. Thank you, Mr. Chairman.

Mr. Jesko, how much fuel or energy does it take for you to produce 1 gallon of alcohol?

Mr. JESKO. We really have no knowledge of that because we were going to burn manure from our feedlot to produce the alcohol. The energy in manure is a waste product anyway. We were going to utilize a waste product to make the energy for our alcohol plant. It cost me nothing as far as energy is concerned except to build a plant with a boiler to burn manure.

Mr. ROTH. Thank you.

Mr. LLOYD. Thank you very much.

[The biographical sketch and prepared statement of Mr. Jesko is as follows:]

MR. Rudy Jesko
210 Washington
Clayton, New Mexico 88415

March 17, 1980

Mr. Dick Hapke
Congressman Lujan's Office
Federal Building
5th. & Gold
Albuquerque, New Mexico

Reference: Resume for Rudy Jesko

Dear Sir:

My name is Rudy Jesko. I am a 44 year old farmer-rancher in Union County, New Mexico. I have been at the same location for 17 years. I am married and have a girl 15 years of age and a 12 year old son. I was reared on a farm and have deep roots in making my living from the land. My only break from the farm was 2 years in the U.S. Army and 3 years in college.

In my farm operation, I utilize 21 irrigation wells on approximately seven thousand acres of prime, circular irrigated land. This, along with all the various equipment used for planting, cultivating, etc., keeps me in the energy market constantly. My irrigation motors use diesel and natural gas, the farm and feedlot equipment use gasoline, and the irrigation sprinklers are mostly electric.

My immediate project is to do something about the cost of energy and try to put my operation back on a profitable basis.

Sincerely,

Rudy Jesko

Reference: Written Statement of Rudy Jesko
210 Washington
Clayton, New Mexico 88415

President Carter has spoken of projections in the neighborhood of 5,000,000 gallons of grain acohol in the next 12 months. The President has also spoken of Federal funding for farmers to construct gasohol plants and other energy developments.

Government agencies have phantom plans, but must get together with businessmen and gear themselves to these production levels. In planning and designing a gasohol plant, I have been unable to find any co-operation with agencies and people at the grass-roots level. Technical and financial experts are available, but no agency can direct you to funds which are supposed to be available.

Five areas which could help in energy prodcution are:

1 Establish an agency which has authority over grain acohol. This agency or committee could be made up of personnel which are already familiar with problems from each agency, such as: BATF, FmHA, SBA, DOE, EPA, etc. This committee should have a once only budget and be able to cut across departmental lines to coordinate all phases of energy production.

2 Standards and specifications need to be established in areas of safety, credit, quality, quanity, technology, finance, production, tax exemptions, security policies, regulations, and etc.

3 Timing which is crucial to a project should be maintained. Because ingredients and feed stocks are seasonal, a sixty day delay can actually become a full year. Negative attitudes or policies of "I get paid no matter how much time I take" or "Not being complete on details that are essential to a project approval" can kill a proposal as surely as bad management.

4 In addition, tax incentives such as state and federal exemptions should be given. Higher investment credits should be allowed to energy development businesses because of the high risk factor.

5 Ideas and plans should be safeguarded in order that commercial firms cannot infringe upon the rights of individuals. Commercial firms are selling plants that are not built to any standard or specification and would-be producers are getting stung.

Rudolf Jesko

STATEMENT OF JOHN LOLL

Mr. LOLL. Mr. Chairman, I would like to thank you for inviting me here.

First of all, the document that you have in front of you is just a draft document. I am here today representing myself. I have been told that the New Mexico Department of Agriculture will be sending you written testimony directly. Also the Governor's alcohol fuel task force will be responding directly.

New Mexico has long been active in alcohol fuel matters. We have held five workshops and lectures over the past 2 years on a statewide basis. A private group in Clovis has formed a gasohol promotion committee. Our State universities are currently doing research and development work regarding alcohol fuels and the Governor has appointed an alcohol fuel task force, of which I am the coordinator.

From a commercial standpoint, we have a privately funded commercial operation under construction in Roswell, N. Mex. We have many experimental stills in operation. I have talked to or dealt with people looking at commercial type operations for Clovis, Floyd, Portales, Tucumcari, Roswell, Carlsbad, Deming, and Las Cruces. These commercial applications range in size from 100,000 gallons per year to over 10 million gallons per year. They range from the small farm cooperative with farmers being in control, to major companies where bankers and stockbrokers are in control. They also range in level of activity from the point of just looking into the equipment that is available, to having hired engineers and cost accountants.

I have been in an active role regarding alcohol fuels for the past 2 years, the last 3 months of which were with the New Mexico Department of Agriculture and the alcohol fuel task force. I have seen the interest in alcohol fuels grow from just a few members of the American Agricultural Movement talking about making their farms energy independent, to where several requests for information regarding production and use are received per day.

To start with these requests were from the agricultural community. Now they come from all segments of society. An example is last Sunday I spent 2½ hours on the telephone with a high school student who was doing a science fair project showing the feasibility of ethanol production. I have also talked with many bankers and stockbrokers. At the present time, the requests for information and assistance is greater than the State's ability to handle them. The people we have sent to the hotline at the Solar Energy Research Institute are reporting that the line is busy and/or the quality of information is lacking. It should be noted here that alcohol for fuel is in its infancy. SERI and others are doing their best to keep up.

A point which should be addressed next is what the Federal Government has done to raise the level of expectation of the private citizen without being able to deliver. A case in point is that on January 16, 1980, on the TV program "MacNeil-Lehrer Report," Mr. John Sawhill of the U.S. Department of Energy stated that anywhere between $8.5 and $12.8 billion will be spent over a 10-year period by the Federal Government on alcohol fuels. You probably have no idea what a statement like that does to some people. I have talked

with several people who I believe, and this is purely a value judgment on my part, who do not have the capacity to carry out a business venture such as alcohol fuel production. Basically they are a few bricks short, but they want to get involved. These people have heard about the billions of dollars which are supposedly waiting to be picked from the Federal pie-in-the-sky. I ask you, therefore, please do not wave imaginary dollars in the people's faces so as to prematurely raise their level of expectation.

Development of alcohol fuel production plants is looked upon by many people of New Mexico not only as development of a new energy source, but also as a way to create rural development. Many areas of New Mexico are looking at alcohol fuel as a way to revitalize their communities. An example of this is a group in Floyd, N. Mex., has formed a corporation of 25 equal shareholders. The community of Floyd is an economically depressed area. The residents are worried about their schools being shut down. To them they feel that the building of this alcohol plant will prevent their children from being bused 60 miles to school. They also feel that the agricultural community will benefit because of the local markets for their crops and the potential that they will be able to shift to a less water intensive crop. That is an important part because New Mexico is different from other places you have visited. We just do not have the water resources that other places do.

Next I would like to address the problems which are holding back development of production of alcohol fuel in New Mexico. First, would have to be the lack of technical expertise. There is a need for engineers to qualify and package equipment that is on the market today. There is also a need for cost accountants who are knowledgeable on alcohol fuel production who will put together a complete pro forma with all the variables included. The last thing that is needed from a technical standpoint is proposal writers to package the total business venture into a complete proposal that is acceptable to agencies such as Four Corners, EDA, Farmers Home Administration, and whoever else would be receiving it.

The next developmental holdback is the lack of financing. There are several factors involved here. Those problems are the prime rate is high and changing all the time, (2) the financial organizations are not knowledgeable about alcohol fuel matters, so they do not know what questions to ask, (3) the Federal moneys which are available are just guaranteed loans and lenders in today's money market are not very interested in the necessary redtape and regulations involved in long-term financing.

Next comes safety. I have not seen a complete report which defines the safety considerations and parameters involved in the production of alcohol fuel. This is going to be needed for the proliferation of small production units which are proposed. The problem will arise in the insurability of these plants.

Now we come to the equipment and technology that can be a drawback to production. As you know, the technological advances are coming at a very rapid rate. These advances are making the small-scale potential producer spend a great deal of time and money traveling about the country looking at equipment. There is a need for central and localized information centers which have the latest equipment in-

formation. These centers would compile the latest data on the equipment available and test data on actual in-field trials of equipment. In addition to equipment, they would follow chemicals which are involved in the production process.

To summarize my statement, there is at present a need for the following: There is a need for more manpower, for localized information centers; workshops are needed directly aimed at bankers and other financial institutions on alcohol fuel production; there is a need for real Federal dollars for both the innovators and the producers on a nondiscriminatory basis. This is an important point. Discrimination comes from the fact that the farm cooperatives, the independent farmer, inventor, the small businessman, do not have the capacity to do proposal writing that the larger organizations and educational institutions have.

Now, council of governments have tried to help out. There is a certain limit as to how much the present existing staff that might be involved in proposal writing can actually do.

Fourth, work is needed on safety considerations. Fifth, test standards should be set on field trials of equipment, so as insure less flimflam by equipment manufacturers. Last, a policy statement should be made or decided upon as to where Federal and State agencies put the role of alcohol fuel development. That is to say, is alcohol fuel an agricultural concern, a rural development concern, or strictly an energy concern, or is it all of the above?

Thank you.

[The prepared statement of Mr. Loll follows:]

Testimony of John Loll, New Mexico Dept. of Agriculture, Governor King's Alcohol-Fuels Task Force Coodinator

March 21, 1980

Before House Committee on Science and Technology. Congressman Lujan, Roth, and Lloyde presiding, Albuquerque Convention Center, Albuquerque, New Mexico.

Subject; Small Scale High Technology & Innovation Meeting

New Mexico has long been active in alcohol-fuel matters. We have held five workshops - lectures over the past two years on a state wide basis. A private group in Clovis, has formed a Gasohol Promotion Committee. Our state universities are currently doing Research and Development work regarding alcohol-fuels and Governor King has appointed an Alcohol-Fuel Task Force of which I am the coordinator.

From a commercial stand point, we have a privately funded commercial operation under construction in Roswell, N.M. We have many experimental stills in operation and I have talked to or dealt with people looking at commercial-type operations for Clovis, Portales, Floyd, Tucumcari, Roswell, Carlsbad, Deming, and Las Cruces. These commercial applications range in size from 100,000 gallons per year to over 10 million gallons a year. They range from the small farm cooperative with farmers being in control to major companies where bankers and stock brokers are in control. They also range in levels of activities from the point of just looking into the equipment that is available to having hired engineers and cost accountants.

I have been in an active role regarding alcohol-fuels, for the past two years. The last three months of which were with the New Mexico Dept. of Agriculture and the Alcohol-Fuels Task Force. I have seen the interest in Alcohol-Fuels grow from just a few members of the American Agricultural Movement talking about making their farms Energy Independent to were several requests for information regarding production - and use received per day. To start with, these re-

quests were from the Agricultural community, now they come from all segments of Society (i.e. Students with science fair projects to bankers and stock brokers). At the present time the requests for information and assistance is greater than the state's ability to handle them, and the people we have sent to the hotline at the Solar Energy Research Institute, are reporting that the line is busy and/or the quality of information is lacking. It should be noted here that alcohol for fuel is in its infancy, and S.E.R.I. and others are doing their best to keep up.

A point which should be addressed next, is what the federal government has done to raise the level of expectation of the private citizen without being able to deliver. A case in point is that on January 16, 1980 on the TV program MacNeil-Lehrer Report, Mr. John Sawhill of the U.S. Dept. of Energy stated that anywhere between 8.5 and 12.8 billion dollars will be spent over a ten-year period by the federal government on alcohol-fuels. You probably have no idea what a statement like that does to some people. I have talked with several people who I believe (and this is just a value judgement on my part) do not have the capacity to carry out a business venture such as alcohol-fuel production. But these people have heard about the billions of dollars which are supposedly waiting to be picked from the federal pie-in-the-sky. I ask you therefore, please do not wave imaginary dollars in peoples faces so as to prematurely raise there level of expectation.

Development of Alcohol-Fuel production plants is looked

upon, by many people of New Mexico, not only as development of a new energy source, but also as a way to create rural development. Many areas of New Mexico are looking at alcohol fuel as a way to revitalize their communities. An example of this is a group in Floyd, New Mexico has formed a corperation comprised of twenty-five equal shareholders. The community of Floyd is an economically depressed area. The residents are worried that their schools will be shut down, and to them they feel that the building of this alcohol-fuel plant will prevent their children from being bussed 60 miles to school. They also feel that the agriculture community will benefit because of a local market for their crop and potentially they will be able to shift to a less water intensive crop.

Next, I would like to address the problems which are holding back development of production of alcohol-fuel in New Mexico. First would have to be the lack of technical expertize. There is a need for engineers to qualify and package equipment that is on the market today. There is also a need for cost accountants who are knowledgeable on alcohol-fuel production who will put together a complete pro forma with all of the variables included. The last thing that is needed from a technical viewpoint, is proposal writers to package the total business venture into a complete proposal that is acceptable to the Four-Corner Administration, E.D.A., Farmer's Home Administration, bankers and whoever else will be receiving it.

The next developmental holdback is the lack of financing.

There are several factors involved here. Those problems are (1) the prime-rate is high and changing all the time, (2) the financial organizations are not knowledgeable about alcohol-fuel matters, so they do not know what questions to ask, (3) the federal monies which are available are just guaranteed loans and lenders in todays money market market are not very interested in the necessary red-tape and regulations involved in long term financing.

Next comes safety, I have not seen a complete report which defines the safety considerations and perimeters involved with production and use of alcohol fuels. This is going to be needed for the proliferation of small production units which are proposed. The problem will arise in the insurability aspect of these plants.

Now, we come to the equipment and technology that can be a drawback to production. As you know the technological advances are coming at a very rapid rate. These advances are making the small scale potential producer spend a great deal of time and money traveling about the country looking at equipment. There is a need for central and localized information centers which have the latest equipment information. These centers would compile the latest data on the equipment available, and test data on actually in-field trials of equipment. In addition to equipment they would follow the chemicals which are involved in the production process.

To summarize my statements there is at present a need for the following; 1. More manpower is needed for localized

information, 2. Workshops specially directed for bankers and other financial institutions on alcohol fuel production, 3. Real federal dollars are needed for both the innovators, and producers on a non discriminator basis (Note: The discrimination comes from the fact that farm cooperative, inventors, and small businessmen do not have the capacity to do the proposal writting the larger organizations and educational institutions have.), 4. Work is needed on safety considerations, 5. Test standards should be set on field trials of equipment so as to insure less flim-flam by equipment manufactures, and last a policy statement should be made or decided upon as to where federal & state agencies put the role of alcohol-fuel development. That is to say, is alcohol fuel an agricultural concern, a rural development concern, or an energy concern or all of the above.

Mr. LLOYD. Mr. Lujan.

Mr. LUJAN. I think that is an excellent statement and really puts it in perspective.

I do have a couple of questions along the lines of your testimony.

You mentioned there are some experimental stills in New Mexico already?

Mr. LOLL. That is correct. Mr. George Autry is operating an experimental still in Pep, N. Mex. The still capacity is 25 gallons per hour. Right now he has got a limiting factor as far as how much he can run because he only has one fermentation and cook tank. That limits it. Basically he could expand with additional moneys, based upon his distillation costs, to about 200,000 gallons per year.

Mr. LUJAN. What would that cost be?

Mr. LOLL. Well, George Autry is a very remarkable man. He is actually producing alcohol and running it in his own equipment. He has got a plant which is producing 25 gallons an hour and his total cost, which he has stated to me, is $5,000. He has used bailing wire technology. He has gone to army surplus stores and bought a steam jennie. He designed and built his own fermentation cook tanks. He has fabricated most of it himself. To expand it to 200,000 gallons, if he can continue to do it on his own, it would probably cost him $100,000, which is considerably less than what you would go out on the market and purchase it from some equipment manufacturers.

Mr. LUJAN. In the Washington area, you can go to almost any filling station, particularly Texaco stations, all the Texaco stations in the Washington area, and fill up with gasohol. Why can't you do it here?

Mr. LOLL. Basically the gasohol that is supplied there is coming from the Archer-Daniels-Midland plant in Decatur, Ill. Texaco has stated that they were going to test market gasohol in Albuquerque, N. Mex. I was on the phone to Harry Weisentine, who is president of the National Petroleum Distributors Association, also marketing director for Horn Oil Co., he stated that Texaco has pulled out because they could not find any alcohol. ADM and Midwest Solvent, the two largest manufacturers, are selling everything they can make. That is the basic reason.

Mr. LUJAN. If we have the feedstock for it, as Rudy has indicated, why wouldn't it pay some company to come in and do it?

Mr. LOLL. I have talked with people like the Quinen Company. I have talked with stockbrokers and bankers, people with a lot of money, and they really and sincerely want to do it. One of the things is defining what kind of role this is. If it is a pure energy role, then a lot of us people who like to be spokesmen for agriculture might as well spindle up and twist off. Eventually it is going to happen. I have seen feasibility studies in the State of New Mexico which produce anhydros ethanol for 90 cents a gallon. The current commodity price is $1.70 a gallon. Senate bill 39 was just passed by the State of New Mexico which puts a moratorium on road-use tax and also on gross receipts tax on alcohol fuels. It is profitable. The thing is that the local agricultural communities cannot finance it in today's financial market for the factors that I stated.

Mr. LUJAN. But you say it is a solution to the energy problem. Where is the conflict with agriculture?

Mr. LOLL. Agriculture doesn't have the money to finance these plants.

Mr. LUJAN. But if these big companies that you are talking about that do it in Illinois, if they have the stock to put into it, if the Rudy Jesko's of New Mexico can supply the material for the plant, where is the conflict?

Mr. LOLL. If ADM, and ADM is seriously looking at the State of New Mexico, OK, to put in an extremely large plant, if ADM, OK, say, Standard Oil or whoever, came in and put in a big plant, it would benefit the agricultural community. ADM has a book out on alcohol fuels and explains their company. They make the statement that they are producing alcohol from corn and that raises the total price of corn in the United States 3 cents a bushel. They are taking that much off the market. So everybody is going to benefit. To what extent? The community of Floyd, N. Mex., wants some type of industry there to bring in more people, to revitalize the community. They can also provide a local high-protein feed source.

Mr. LUJAN. So you are talking about the huge plant versus the small localized plant?

Mr. LOLL. I am talking about as far as pure energy, the energy companies are going to do it and can get into it. When they realize the profitability of it, they are going to do it. ADM, Midwest Solvent, some of the larger people that are already in it, they are going to do it. Maybe I am just speaking from a very moral position, and this may not be a meeting where you want morals, but I think it is right to revitalize——

Mr. LUJAN. Where is the immorality of a big alcohol plant? It would seem to me that if you built a great big plant in Tucumcari, that happens to be in the northern district and close to Clayton and close to Clovis and all of those places, and the farmers could then bring it in to Tucumcari and you would have a big plant there, it seems to me like everybody would benefit from it. I don't understand what you are saying.

Mr. LOLL. Basically what I am saying is the level of the benefit. It doesn't matter whether the plant is in New Mexico or just across the border in Texas. As long as we are expanding the market, everybody benefits. It is the level of the benefit. The level of the benefit of having a small plant right there in Floyd, which employs local people, local people with local children who go to the school system, what I am basically trying to say is there is a potential here for really rural development. Now, ADM, Midwest Solvents, the Bank of Roswell, other people, large people who are looking at alcohol production on a large scale, they are not going to put a plant in Floyd. They will put it on a railhead. They are going to put it in a major town. They are going to put it in downtown Clovis, downtown Portales. They are not going to put it out in Floyd. It is going to help those communities and there will be some spinoff, but I am just trying to put it into perspective that this has a real potential for rural development.

Mr. LUJAN. Thank you.

Mr. LLOYD. Mr. Roth?

Mr. ROTH. Thank you, Mr. Chairman.

I would like to follow up on the question of if you were to use the corn for the production of alcohol it would raise the cost about 3 cents per bushel. I hear that many places where we work with alcohol fuels and they say it is a question of food versus fuel, do you believe that or what is your analysis of that?

Mr. LOLL. I really don't believe that. The basic reason being, and this seems like a rash statement, is that there is no worldwide food shortage, but let me explain. There is not a worldwide food shortage as much as there is a worldwide protein shortage. You look at Asia and you look at these other countries, most all of them have a high carbohydrate type crop, rice or potatoes. The distended belly that you see, a lot of that is from the real protein shortage in people. So there is a potential that we could grow grain crops, utilize the carbohydrate content and concentrate the vitamin content, fiber content and the protein into this high-protein feed and then send it over. It would reduce shipment costs. It would probably reduce the moisture content of it. It would be giving them exactly what they need.

One of the holdups for that is the Food and Drug Administration has to approve, or clear dried distillers grains for human consumption. That whole concept, in other words, what you are doing is you are taking a feed product and you are taking part of it and you are making it into a better feed, human and animal food. You are taking the carbohydrates which the doctors tell us we don't need so much of, and you are converting that part of it into an energy source.

Mr. ROTH. How about the other contention we hear so often that we are exchanging energy? I asked Mr. Jesko a little while ago about how much energy does it take for him to produce 1 gallon of alcohol and he gave us his explanation. You get around New Mexico and what do you find, how much energy does it take to make 1 gallon of alcohol?

Mr. LOLL. A real good analogy is how far can you go on 1 gallon of gasoline? It depends upon whether you have a Honda Civic or a Rolls Royce. They both can take you from point A to B, but one will take you a whole lot further than the other. It depends upon the equipment. The equipment going into Roswell under contractual agreements is going to produce alcohol, each gallon of anhydrous ethanol, for less than 20,000 Btu's. The equipment manufacturer stated to me that he is hoping to get it around 9,000 Btu's. There is approximately 80,000 Btu's in a gallon of anhydrous ethanol. There is about 40,000 that are used in the total farming process. There is a net energy gain with this type of equipment. There is also equipment available today on the market which will produce that same gallon of anhydrous ethanol which takes 60,000 Btu's of energy to produce 1 gallon of alcohol. If you buy that equipment, there is going to be a net energy lost or at least an exchange from one source to another. If you talk Btu for Btu, that is not really a valid source. If you use a heat source such as manure, something that is an extra anyway and isn't very marketable in Clayton, and in Albuquerque manure is becoming very high priced because of all the local gardening, but in Clayton there probably isn't much of a market for it. A lot of plants in feasibility studies are seriously looking at coal. If you are taking a million Btu's of coal and

producing a million Btu's of this transportable fuel, the value there is increased. You are taking a fairly abundant fuel which cannot be used in automobiles right now and you are converting it to a very valuable fuel. So that Btu to Btu analysis is not applicable.

If you are using diesel fuel, the original thing that ADM was using was diesel fuel, and from what I have been told, and I don't know this for sure, but it was quoted that they were using 3 gallons of diesel fuel to produce 2 gallons of alcohol. Well, they have changed that. They are now to where there isn't a net energy loss in the process, but if you were to consider the agricultural segment, in other words, the fuel used in growing the crops, they would be at an energy loss right now, the major companies.

Mr. ROTH. That sort of dovetails into the question of the technology that you had mentioned. When you work with someone like Mr. Jesko here, do you have a clearinghouse? If he has an idea, can you go to the Department of Energy and say, well, has this been tried in Wisconsin, has this been tried in Pennsylvania, so that we are not reinventing the wheel all over again?

Mr. LOLL. That was my point on the need for a decentralized area. One of the things has just been my time constraints, my inability to serve all of the people. For what I get paid, for 50 hours work, I decide that is enough. There is a tremendous need for these information centers to collect this kind of data of actual field trials, what actual chemicals are available and their prices, et cetera. I actually cannot do that. I have fliers from about five or six companies. I don't have one single report on a field trial on equipment. There are a number of people selling equipment today who have never made a piece of iron. I know one company that has accepted cash money for 10 orders or 10 plants and they don't have a plant. That is scarry from a consumer standpoint.

One of the things that USDA has talked about, and I don't know whether they have finalized it, under their guaranted loan programs, to be OK'd at the county level the equipment will have to have been field tested for, say, a 60-day period. To really say, in fact, will that produce alcohol only using this many Btu's, will it use 95 percent of the carbohydrate, will it produce a quality high-protein feed. Once those tests have been done, then there can be a clearinghouse, there can be some information center. Now SERI eventually wants to do that. Right now there are very few people manning their hotlines. They are hard to get in on. They basically took two hotline centers, one in Minnesota and one in Louisiana, and centralized them in Denver, Colo. They are trying to pull in the expertise. There just isn't the expertise available from them. Right now, Mr. Jesko has to fly around the country or drive around the country and look at different equipment. Then he has to believe what the equipment manufacturer says.

Mr. ROTH. Thank you.

Mr. LLOYD. Mr. Diluzio.

I know you have a statement and without objection we will accept that for the record.

We have to keep rolling along so I want to encourage you to be brief.

STATEMENT OF FRANK C. DILUZIO

Mr. DiLuzio. I will be brief. I will go directly to the recommendations and explain each one of them. I think that would be the fastest way of doing it.

Mr. Lloyd. You are really dealing with gasohol or alcohol?

Mr. DiLuzio. Right, its technology and economics in general.

One of the problems, of course, is that most people don't really understand that there is nothing new in gasohol. It was developed in the later 1800's. There were cars made in this country in the 1900's and exported with alcohol burning motors. The first Model-T's had convertible carburetors. So there is really nothing new in the idea. What is new, maybe the national will try to do something to offset our dependence on OPEC and gain some of our pride back and solve some of our problems, instead of depending so heavily on OPEC for our energy.

I think another mistake is being made, and that is that we talk about gasohol plants as if there is only one variety. I think the gasohol problem should be broken down into three major areas, each of which has its own peculiar problems, and each may have its own solution.

First, I think a small-plant concept for farms or co-ops or very small regional plants is one concept which I think should be implemented as soon as possible.

Second, the regional plants, which are much larger, and whose economics both in terms of economy of cost and economy of energy, are different than the small farm plants.

Third, the big dream in America is that the largest has to be better. In this case it may not be because of the economics of the cost of moving feed to the plant and moving products out to points of use, and the economics of net energy.

When we talk about net energy, loss or gain, we have to define what we are talking about. If one is talking about starting with the energy to plow the ground, the raising, and fertilizing and watering of the crops and harvesting and hauling the crops to the plant, the total energy input into the end gallon of gasohol is very high. If, however, one is using waste or distressed crops, you have a different balance. The large plant may be very process-efficient in producing alcohol, but you have to remember the great distances you have to haul feed to it, and the great distances you have to haul the end product to distribution points, particularly if it uses agricultural crops raised specifically for the plant.

Each of these three areas has to be looked at separately.

The recommendations are based on my having gone through the moving of technology through R. & D. to the hardware design stage into the construction of desalting plants. In my opinion, gasohol is a program almost parallel to the development of desalting units. In further cautions, you can spend all your time developing new technology and thereby gain a few cents a gallon in the cost of alcohol. In the meantime the inflationary cost of building the plants, that is, the cost of bricks, mortar and labor will go up 17–20 percent per year, you will never catch up with that parade. You have to make a decision on the production and cost of gasohol not only on the economics of

building and operating a plant, but also other intangibles, that is, freeing the farmer from dependence on uncertain fuel supply during the critical periods of planting, harvesting, crop drying, and delivery of crop. The availability of fuel during irrigation periods in itself is worth a lot of money to a farmer. These factors should be added to the cost comparison and profit factors. The independence from having to buy import oil is another one. Even our pride has a price. Getting a little bit of your pride back is like money in the bank. Proud aggressive people really try hard to do things that are meaningful.

Having gone through the experience of R. & D. and building of small water desalting plants to large 10 multimillion gallons per day plants, has convinced me that the technical people will drive you crazy with suggested improvements to the designs. Any designer worthy of the name will always know how to design a better plant 5 minutes after they have finished the first one. Congress has to have the backbone to take it away from them and put it into production and on the market. That is what the management of technology is all about. If a designer doesn't know how to design the second plant better than the first one, he is not a very good designer and he should be fired. If you leave it to the technical people, there is always a new plant coming around the corner which is more efficient, costs less, and can be built immediately. The bankers hearing about the new promises will instinctively wait until the new plant comes along which is presumed to be more efficient and cheaper. Firms don't even put new equipment into place because they are waiting for this miracle, which never happens. One has to be very sensitive to this issue with all new technology, particularly engineering and process development.

It seems to me that there are 10 recommendations that I would make.

One: You must concentrate more effort on the development of small-scale production plants utilizing local farm wastes, distressed crops and surplus of grain, et cetera. You have got to process these crops; taking out of corn, for example, the germ, the oil, the things which have a value of their own. John is absolutely right. All you remove through the processing of corn is the starches. You concentrate the protein. The only trouble is, and, again, this has been my experience, you try to provide strange foods to countries with strange dietary habits, and you have real problems. You can't even give it away. So while from a nutritional standpoint it may be an extremely valuable protein, you can't give it to them because it looks like a handout of waste products by a rich nation to a poor nation. There is a psychological problem involved that no one has ever found a real answer to.

Two: You have got to develop more energy-efficient ways to produce both ethanol and methanol, which, by the way, is another source of alcohol. We are blessed with great quantities of coal. For example, you must reduce the number of distillation stages you have to put the process through because that reduces the energy requirements. You have got to associate the production of gasohol or ethanol and methanol to waste energy produced by powerplants, nuclear plants, industrial complexes, et cetera. As an example, the Department of Interior proposed to distill sea water by using waste steam from nuclear plants which had already generated electricity but was still hot enough to distill water.

You have to produce more than just a single product from any chemical or thermal process.

Three: You have got to develop more effective cooperation between the DOE and the DOA. They both have vested interests and their own little kingdoms. DOA is the great protector of nutrition and agricultural products in this country, and they are very much concerned about the impact gasohol production will have on foodstuffs, the price of corn, the price of corn products, et cetera. This is particularly true with respect to large plants where you specifically plant large acreages for the production of feed to the large plants. This is different than where you use waste sorghum, beets, or sugar cane, or other agricultural wastes. Those types of wastes are available and that is why a decentralized series of plants built close to the same source of this feed helps you in the net energy argument. You don't have to haul the feed great distances nor do you have to haul the product great distances. You burn it almost where you make it. That is something that really ought to be implemented very rapidly.

You must also do something else. The Government always has had a hesitancy to develop equipment. You can't wait for private enterprise to develop small efficient plants in modular sizes in the absence of a firm market. Plant from 20,000 to 100,000 gallons per day of gasohol, or whatever size range you want to build. They will wait until there is a market for them, and someone is going to pay for them. There are things that this country has to do in several R. & D. areas, which must be driven by motives other than profit. The Government may have to do it to build an initial market so the industry can then step in and have someone to sell their products to. You have to standardize these designs because that is the secret of cost reduction, reliability, and safety, at a reasonable cost.

For example, we spent a lot of money learning how to distill water by using better chemistry. In actual experience we saved 1½ cents per 1,000 gallons and in the meantime the cost of the plant has gone up 12 to 17 percent per year. It's a losing battle.

Cost reductions after the initial development and improved processes have to be made by the industries that produce and sell those plants. This cost reduction is due more to plant standardizations and repeatability of production, than to science.

We should look at the standardization and even the building, in my opinion, of easily demountable and transportable plants of several sizes. We did this in the desalting program. We developed track-mounted and even barge-mounted units. Where you have distressed crops in large quantities in a given area, instead of moving the crops and using an awful lot of gasoline and other fuels to move the crops to the plant, disassemble the plant and re-erect it at the new site and thereby take advantage of the surplus or the distressed crops. There is nothing magical about this. You can design a domular plant that is very easily and cheaply transportable by train or by trailer. We have done this with large plants.

We should take a look at energy sources other than the conventional fuels that we have a habit of thinking of. We should get away from thinking that oil, natural gas, and in some cases coal, are the only energy sources. Farm manure as a source of energy is already being

used. You have to look at, as I mentioned before, waste heat from powerplants, process plants, solar, geothermal, et cetera. For feed we should also look at products from sewage plants in cities being very heavy in organics which can be converted to alcohol. There is waste from food processing plants in great amounts that create disposal problems. It is causing an environment problem just getting rid of that waste. Even the cheese plants in Wisconsin have an awful lot of capability of producing alcohol from the wastes. They do produce a lot of end products already, but again, alcohol is one of the end products that they would really produce by using their existing boiler capacity and the process heat of the cheese plant itself, which is there and paid for, and their wastes as feed stock for distillation.

We must simplify the licensing process of small-scale plants. I am talking again, about farm-based plants, not the large producers of millions-of-gallons-a-day plants. Right now, licensing is a time consuming and costly factor. It is tough to comply with all of the regulations. The cost of the bond is excessive. The cost of money is excessive. The cost of recordkeeping is excessive. Small business people, as John said, and he is absolutely right, don't have the finances or the administrative ability to comply with these rules and regulations. You are trying to apply the same set of rules to the master and the servant and they may not fit. You may have to come up with a separate set of rules for small plants in terms of licensing and bonding and everything else which they can work with and understand, not general ones that apply to all plants regardless of size.

We must develop a better blending and storage method of gasohol on a regional basis. I don't think, and I don't mean to be unreasonable with the gasoline companies, but I don't think that in times of a gasoline surplus and when they see themselves as being kings of the world and are trying to get more production from our own national resources instead of importing more, they are going to be very helpful in providing the means to bring in a competitor. I think you have to examine that issue very carefully. They are, after all, in business for profit.

As we discussed at breakfast this morning, if a guy comes in and wants to build a plant with no idea of making money for himself, he is the last man in the world you ought to finance because he is a problem. Profit motivation is a strong driver and the oil industry must be profitable and we may as well recognize that.

The Government should quickly provide financial assistance. There has been $100 million locked up in the Department of Agriculture for several years. They have issued very few approvals. It has been sitting there. It is not that Congress has not provided money, but the fact that the rules and regulations and the processing of proposals is a very long-winded, tenuous course. The available money has not yet filtered down to the right people.

One idea the Office of Saline Water of the Department of Interior used to finance desalting equipment, specifically for Italy and Europe, was the creation of a revolving fund. The U.S. producers of desalting plants couldn't sell them because the European customers had no money although they had a need for the water. The Italian Government put up a revolving fund from which small villages could borrow money to pay for the plant. They then would pay the money back into

the revolving fund as a charge for every 1,000 gallons of water that they consumed. The revolving fund was thereby replenished. After about a year, there was enough money coming back in from plants already in operation to keep the system going. This would avoid the 18, 19 percent interest rate on the money. It would avoid the need to convince bankers they ought to make loans to fund these plants. I know it is a radical idea, but it has worked in other countries and it may work on a highly selective basis here.

Finally, being a research man, I can't resist the temptation to do exactly what I said you ought to be aware of, scientists always having a better way of proposing to do things. You may have heard of the new technology of micro-organisms or gene-splicing and genetic engineering, now being used to produce pharmaceutical products, products from biomass, manufactured and natural foods, and so forth. They are in fact, a chemical factory which has a good habit of reproducing itself. You can produce alcohol by the use of genetically changed enzymes or micro-organisms with very little outside energy input into it. It sounds like a dream, but it is a reality. I think that you are going to see in the next year or so some brilliant ideas proposed where you can produce alcohol by the use of micro-organisms, which is going to cut the hell out of the energy requirements to produce alcohol in the conventional ways. That is the only improvement I see in the near term which might give you cheap alcohol. These micro-organisms are extremely efficient. This is the most exciting thing that has happened in biology in the last few years. Micro-organisms are already or soon will be producing elements, metals, concentrating copper, concentrating certain other elements, they are producing antibiotics; you can engineer micro-organisms to do almost anything that the human body biologically or organically can do. The production of alcohol is an organic process and therefore a good candidate.

Thank you very much.

[The prepared statement of Mr. DiLuzio follows:]

HEARINGS MARCH 21, 1980
ALBUQUERQUE CONVENTION CENTER

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT OF
THE U. S. HOUSE OF REPRESENTATIVE COMMITTEE ON
SCIENCE AND TECHNOLOGY

TESTIMONY OF FRANK C. DILUZIO
ASSISTANT DIRECTOR FOR
INSTITUTIONAL RELATIONS & TECHNICAL LIAISON
LOS ALAMOS SCIENTIFIC LABORATORY

Mr. Chairman:

I welcome the opportunity to present some thoughts as to the need and direction of the synthetic fuel production legislation in general and alcohol fuel in particular.

Alcohol fuel is not new, it had been used in the U. S. replacing whale oil in the mid-1800's. It was seriously considered as a prime automobile fuel by the turn of the century. Henry Ford was a strong advocate of alcohol fuel for automobiles. Early Model T cars had a carburetor easily modified to burn pure alcohol. Argo, its trade name was extensively used until the 1930's. European countries using blends of 10% to 40% have, in the past, made extensive use of alcohol. Several American manufacturers made automobiles for export modified to burn alcohol--so there is really nothing new in the idea. What is new is the economic impact of oil imports and the instability it creates in our economy. It also places in the hands of OPEC the means to influence our economic decisions and national well-being. We are no longer masters of our own economic destiny as long as we import 50% of our crude oil to feed and fuel our society.

The need for fuel and synthetic rubber at the onset of WW II, drove Germany to place greater reliance on alcohol and the need for synthetic rubber forced the U.S. to look to alcohol as feed stock for the production of synthetic rubber. Alcohol fuel consists of 2 types: methanol, a coal derived alcohol fuel, and ethanol, derived by converting agriculture such as corn-grain, etc., and other waste materials from cheese plants, breweries and other food processing operations.

The public attraction to alcohol fuel is best witnessed by the 80 + bills before the Congress. The need for a very high federal priority in the production of Gasohol is certainly justified. Alcohol-based fuels offer an early alternative to continued dependence on foreign oil imports with annual costs of 56 billion in 1979 to 70 billion in 1980. It can, with both federal and state tax breaks, become economically viable. Gov. King recently signed in to law a bill which provides tax incentives for 5 years to promote the manufacture and use of alcohol fuel in New Mexico. The advantage of

alcohol and one other fuel, ethanol and methanol--is that they are based on renewable resources and coal. The nation has been blessed with large coal reserves. Methanol can be produced from coal using available technology which can certainly be improved and made more energy efficient.

There is one thing we must all remember in the production of synfuels, man does not and cannot produce energy - all he can do is change its physical characteristics, to simplify transportation containment, etc. A price, however, is paid for the conversion and in the case of Gasahol, 1/4 to 1/3 of the energy is lost. Given the present state of technology, it takes more energy to produce alcohol than it saves as Gasahol, a mixture of 10% alcohol and 90% Gasahol. Research to produce alcohol fuel in a more efficient manner from farm wastes, etc., should be immediately implemented. More efficient distillation equipment and fermentation methods should be vigorously researched.

The present technology should immediately be implemented particularly in agricultural states to supply local and perhaps regional need. The current DOE plan to put in place programs for small scale, on-farm production of alcohol fuel for local use should be accelerated. It would help the farmer who because of intensive use of farm machinery needs substantial quantities of LP gas, diesel fuel, natural gas, kerosene and other fuels. On a per year average, farms use approximately 6.5 billion hours of farm labor and 1.2 gallons of petroleum based fuels for each hour of labor.

The increased cost of fuel is a very heavy factor in food costs, let alone the fact that farmers have a difficult time in being sure of the availability of fuel during high usage months, i.e., planting, harvesting, transporting, drying and irrigating season. Alcohol fuel produced locally from agricultural wastes and consumed locally presents the best opportunity to provide the necessary fuel when needed. Reliability of supply should help the farmer maintain control of his operation in a more cost-effective manner.

Along with the DOE small scale, on-farm production alcohol program, the drive is to build large plants to produce great quantities of ethanol fuel-- the cost and fuel economics of such an idea should be re-examined very carefully. The cost of the plant, the energy required to haul feed to it and the energy required to distribute the

product increases the net loss of energy; i.e., less energy in btu contained in the product than total BTU's going in. In the short time frame to quickly reduce imports of oil it may make sense, as a steady diet because of the great quantities of farm products required such as grain, corn, etc., it may not.

Methanol produced from coal while still a net energy loser is not quite as bad as ethanol plants.

Greater effort should also be placed on the development of alcohol production processes that produce multiple products, such as animal feed, food additivies, fertilizers, etc., single product processes are not very energy efficient.

Several farm organizations, individual members of Congress and members of congressional over-sight committees from both industrial and agricultural States have been very critical of the implementation procedures and pace of federal implementation of legislative authority already on the books.

The common complaint is that the several departments of government charged and funded to execute the programs are extremely slow and bureaucratic in their actions. It takes forever for a proposal for gasahol plants to be processed, approved and funded. These departments don't seem to have the same sense of urgency that Congress and the public have in moving forward with all prudent haste. An example is that while the Department of Agriculture has more than 100 million earmarked for financial assistance for small scale gasahol programs, only a small trickle has to date reached the farmers and rural communities.

Agricultural commodities and forest products are receiving attention as a source of energy because they "are renewable" and available in great quantities. They are a real source of alcohol. Until these alternative fuels have a greater acceptance and a market, there is a need for federal assistance for production of energy from these resources.

Senate Agriculture's Committees report on S 1775 described this potential as follows, and I quote:

Agricultural Commodities and Residues

Agricultural residues constitute a large tonnage of biomass. According to Department of Agriculture estimates, plant wastes, such as cereal straw, corn cobs and stalks, and sugarcane bagasse, total about 40 million tons of organic solids per year. Farm animals, many of which are confined to feedlots or broiler operations, generate another 210 million tons of organic solids a year. These residues represent an important, and at present largely untapped, energy resource. The net energy yield from 1 ton of dry organic waste is equal to approximately 1.3 barrels of oil. Assuming that only a portion of the potential energy in biomass is recovered, it is estimated that the yield would be close to 160 million barrels of oil annually, a significant contribution to our energy supplies. This is the equivalent of all gasoline and diesel fuel used in farming.

In addition to the use of residues, agricultural commodities can be processed to remove high-value ingredients. For example, corn can be processed to remove the germ, gluten, oil and many other products while using the remaining starch to make alcohol fuel.

One technique that has received wide attention is the manufacture of

gasohol, a mixture of 90 percent gasoline and 10 percent alcohol fuels, produced from a wide variety of agricultural crops and waste residues - all the way from commodities such as corn and sorghum to waste products such as sugarcane bagasse, peanut hull, citrus pulp, or commodities that have gone out of condition in storage. END QUOTE

Gasohol production demonstrates the currently existing potential in rural areas to move toward energy independence. According to the Department of Energy's "Report of the Alcohol Fuels Policy Review", local production and use of gasohol in farm vehicles and crop drying equipment "could provide a measure of local energy self-sufficiency". This report indicates that agricultural biomass feedstocks are currently available in sufficient volume to permit production of 660 million gallons of alcohol annually. The Department of Energy report also examined the longer-term potential for producing alcohol from agricultural biomass and concluded that some 3.7 billion gallons of alcohol could be annually produced, using existing technologies, without affecting the existing land base used for food supplies. With improved technologies, the amount could be much greater.

A new process for converting cellulose to alcohol through the use of enzymes offers great promise. It appears possible to double the output of alcohol from a ton of biomass as compared with conventional processes. This technique would use high cellulose crops, such as sweet sorghum, that can be grown in most areas of the United States.

If these new processes can be refined and put to on-farm and small-scale commercial application, farmers will have a new crop - an energy crop - that they could profitably grow. This could change the net income picture for agriculture

dramatically, such as the advent of soybeans has done within the last three to four decades.

Another process for producing energy from wastes is anacrobic digestion which uses bacteria in an oxygen-free environment to transform such wastes as feedlot manure into methane gas. Small-scale plants designed to demonstrate the feasibility of this process have produced encouraging results. Large-scale plants are just becoming operational. The Farmers Home Administration has committed funding for a major facility at Lamar, Colo.

Producing energy crops from biomass in this country is in its infancy. No crops are now grown for fuel. There are many new technologies being developed, but a problem remains that impedes implementation. Most private lenders tend to be skeptical about financing new ventures such as energy production from biomass. Hence, Federal loans and loan guarantee programs are essential to overcome lender reluctance.

Wood and Wood Wastes

Historically, our National has relied on its forests to build its homes and to provide its paper products. Forests can also supply a significant amount of this Nation's total energy needs. There are, at present, about 488 million acres of commercial forest land producing wood. Wood is one of the most versatile natural resources available. Full use of our Nation's forests offers great potential for providing a substitute for liquid petroleum fuels and natural gas, and for providing a substitute for petroleum feedstocks used in the chemicals and plastics industries.

The potential exists to completely satisfy the entire energy needs of the forest sector through increased wood production, increased residue use, and conservation in logging and milling activities, and to provide energy to the general economy. Six and one-half quadrillion Btu's of energy exist in excess growth, noncommercial timber, logging residue, and standing cull and dead timber - wood that never leaves the forest. An additional 3.1 quadrillion Btu's exist in the form of material that could be produced from thinning and mill waste.

Wood biomass, available on an annual basis, can produce 9.6 quadrillion Btu's of potential energy - over 10 percent of our Nation's yearly needs. In addition, using waste wood as an energy source will permit a new forest industry to take its place alongside the lumber and paper industries, one that would not do away or threaten the present timber supply.

The lumber and paper industries have used wood for energy on a large scale for a long time. Companies have burned waste wood to cogenerate steam and electricity in their plants for years. At present, these industries use about 1.1 quadrillion Btu's derived from wood - more than all other forms of energy produced from renewable sources combined.

Outside of these forest products industries, though, wood has not been very widely used as fuel. There are several emerging technologies, however, that will allow wood to be used to a much greater extent if the necessary incentives are provided.

Energy Balance

The amount of petroleum and natural gas displaced by fuels produced from agricultural commodities and forest products depends on the fuels used in the production process. According to the Office of Technology Assessment:

> The distillery producing most of the fuel ethanol today uses natural gas as a boiler fuel and the ethanol is used to produce a high octane gasohoo. Because local conditions enable this distillery to be particularly energy efficient, the use of gasohol made this way currently saves one-third gallon of gasoline and natural gas energy equivalent for every gallon of ethanol.

Because Federal assistance for less energy efficient distilleries would be counterproductive to the goal of reduced energy imports, the Committee agreed to a provision which prohibits assistance to projects where the total energy content of the alcohol and other fuels produced would not exceed the total energy from petroleum and natural gas used in manufacturing the alcohol and other fuels.

The Committee notes that distilleries fueled with other energy resources such as coal and solar could be very attractive from the standpoint of increased energy independence. Conceivably, some distilleries could "back out" nearly one gallon of petroleum or natural gas equivalent for every gallon ethanol produced.

The Government's Role

The role of government, in this instance, is to provide a clear commitment to the development of an industry producing energy from agricultural commodities and wood products. The loan guarantees and grants provided in this section of the bill would spur farmers, farm cooperatives and industry to construct alternative energy production projects. Bankers and businessmen, who frequently are reluctant to invest in new endeavors and usually take a "wait and see" attitude would witness, first hand, the feasibility and great potential of these government assisted projects. Once government makes this commitment, bankers and businessmen will have the confidence to proceed with similar alternative energy projects using private capital and ingenuity. This is the type of cooperative effort between government and industry that will pay the biggest dividends in reducing this nation's dependence on foreign sources of energy.

Alcohol produced from agricultural residues surplus crops, distressed crops, etc., is only a small part of the answer if we are to reduce import oil, and conserve our domestic energy. We must also improve dramatically the efficiency with which energy is used - we must conserve in every way available to us and we must develop all other viable alternative fuel sources.

Quoting the Honorable John H. Gibbons, Director of the Office of Technology Assessment:

Many of the witnesses before the Committee agreed that conservation is virtually the only energy resource available in quantity to improve the energy supply and demand equation during the 1980s. The Honorable John H. Gibbons, Director of the Office of Technology Assessment, summed up the situation with the following remarks:

In the mid-term, the next 5 to 10 years or so, we have one main option for reducing U.S. energy imports and that is to improve the efficiency with which energy is used - no other energy option can have such an impact during this time.

Recommendations

1. Concentrate more effort on the development of small-scale production plants utilizing local farm wastes, distressed crops and surpluses of grain etc.
2. Develop more energy efficient ways to produce both ethanol and methanol fuel. Example: reduce the number of stages now needed to produce commercial alcohol and develop equipment and processes that are more energy efficient.
3. Develop more effective cooperation between the DOE and the DOA so that the production of alcohol fuels don't adversely impinge on the production of food and feed needs in this country and abroad.
4. Promote the development of a line of modular designed, new generation of distillation units of various sizes to match local farm and regional needs. Designed to be easily maintained and operated and not technically sophisticated.
5. Study the feasibility of designing intermediate sized units that are easily demountable and transportable to farm areas which have farm waste, distressed or surplus crops. Transporting units would be much cheaper than moving crops to regional or national alcohol production units.
6. Examine other than conventional sources of energy, i.e., fuel, oil, natural gas, etc., for fueling distilling plants.
7. Find ways to simplify the licensing process of small scale plants and examine way to license before building to reduce risk to builder. Reduce cost of bond

requirements and record keeping. Expedite the processing of applications and funding of plant proposal.

8. Develop more efficient storage and blending methods.
9. Provide financial assistance necessary to have sufficient initial working capital. Startup costs can cost as much as the construction costs of the plants.
10. Accelerate the research and development of efficient micro-organisms to ferment a variety of feed material to produce alcohol. It is a very exciting concept, and based on progress and success to date in using micro-organisms to produce a variety of chemicals and products is an achievable goal. Time cycle to make genetic changes to selected micro-organisms is about 2 years. Bioengineering cycle 5-20 years. Selected micro-organisms are very efficient, are self-reproducing and are very efficient chemical factories and low-energy users.

Mr. LLOYD. Thank you very much, Mr. DiLuzio. We appreciate your being here with us today.

I think that you probably summed some of these things up. I would like to make a couple of points. One of the major problems that we have in Government is how far we go into the private sector. Small business thinks we go too far or business thinks we go too far. On the other hand, you are telling me, for instance, that you want to have these alcohol plants, you want them moved out, decentralized, you want them close to Rudy over here so he can produce his alcohol utilizing wastes or solar energy as heat or whatever it may be as the biological activity.

The problem is, as I think Mr. DiLuzio alluded to, that the energy companies are not just overwhelmed then, if you are making the profits. If you haven't read the papers lately, I would remind you that they are making a profit. What impetus, what methodology do we have to encourage these people? You are talking about gasohol. Gasohol is some mixture, at least at the present moment, of 10 percent or greater. You are not in the mainstream of the energy source, you are not dealing with Texaco or Standard Oil or somebody like that. The other method is, to modify the machinery. Again as Mr. DiLuzio has alluded to, we have had machinery which has operated directly on alcohol, and indeed you can run diesel engines or turbines or even a standard reciprocating engine on gasohol if you meter the fuel properly, and change the carburetion. But you don't have the money to get the automobile manufacturer to make that change, and you also don't have the impetus nor the money to drive the system to go into the energy companies, Texaco and Standard. Standard Oil is going to sit there and wait until you are all through and you can't do it any more, then they will buy your alcohol for what it costs you to produce it and sell it to make a profit, if indeed, there is a profit.

There is another area where we simply have to agree, and that is, one which you all have alluded to, that for every Btu of energy you put into it, you had better come out with a plus factor or a social good. A social good would be changing nontransportable energy into transportable energy, going from coal to gasohol, which is 100 percent Btu.

So in bringing all these things together, I think you have pointed out the problem that we as a committee are having trying to bring this all into focus. There are some folks who say they want to be involved in the energy process, but they only want it in a very specific area. We can go out and look for oil in the North Sea, but as to producing transportable energy in New Mexico with Rudy online and Mr. Loll online and with Standard online, we don't have the ability to generate that. Rudy is willing. Mr. Loll is willing. But I am not so sure that these "energy corporations" who are already making these kinds of profits that we have been talking about are going to make that change unless the Government mandates it. The minute we mandate it, I am going to have you, Rudy, and you, John, maybe even you, Frank, saying to me, "Why don't you get the Government out of our area." What do you say to that?

Mr. DILUZIO. Mr. Chairman, can I answer that on the basis of experience? I ran into the same problem with manufacturers of desalting equipment. They knew all there was to know. The fact that some of

them had learned it by working under Government contracts and had been paid to learn it, was very quickly forgotten. They didn't want anybody else to get into the industry. Nobody talked about transfer of information or giving learning contracts to other industries to build plants without their objecting, and they testified against the idea many times. Congress was wise enough to pass the bill expanding the Government's role, anyway, and provide the money to make the technology available to small firms. The big industries—I don't need to name them—didn't want us to do that because they said we were building competitors for them.

That is why I think that it is very important that the gasohol problem be cut into three parts. You may get away with that approach in building the small farm plants, you may get away with plants of, say 100,000 gallons a month up to 1 million gallons a month, but you will run into trouble with larger regional or national commercial plants. If you break it down into three pieces and work on the farm-sized plants and give the farmers a chance to help themselves in using these surplus crops which are being wasted, and stay away from arguing initially that you want to plant 10 million acres of corn and build a multimillion gallon-per-day plant, you may succeed. The farm size, which can be done by farmers and small co-ops that burn the product locally and get the feed locally, are not going to bring the oil or large industrial companies out in force. When you get into the million gallon per day size you are talking about big money and you are talking about these massive corporations which are the only ones who have the resources to build and operate them and distribute the product efficiently.

You have got to move into gasohol production very quickly because the easiest way to get the oil companies to participate is to show that there is a profit to be made. Don't wait for them to decide when that time is, but start small. In the desalting business we did not build the desalting plants ourselves. We provided the technology, and industry built the plants. They were always part of the team. They did the design, they did the hardware and production, they did the selling and servicing of the plants. The Government never did that. We pushed the state of the art and gave anyone who wanted to use it at least one good technical answer to his problem. From then on the improvements were made by industry itself.

Mr. LLOYD. Mr. Lujan?

Frank, in breaking that down, and we are not concerned about the big company, if they want to build a gasohol plant they can go ahead and do it, but we are concerned with the small farm plant. John talked about there not being a central place for all the information. What about places like TAC, don't they have——

Mr. DILUZIO. Well, TAC was set up originally, as you know, by the NASA at the insistence of Clint Anderson. They were supposed to be the collectors of technology and stored in memory banks data which could be used to solve small business problems in terms of technology.

Mr. LUJAN. What is the name for TAC?

Mr. DILUZIO. Technical Applications Center.

There is no reason in the world why there couldn't be a center of information. The hotline, while useful, is not enough. What you need

is not only the technology that is available in an understandable form, but the talent to understand that information and the talent to translate it into action. At TAC we argued for several months to get the State to provide graduate engineering students to be interpreters of this technical information for the small businessman that needed help. The large firms don't need the help, they are the ones who generated this new information and they generally have strong engineering and science in-house staff.

Mr. LUJAN. Yes, but couldn't they take the information of all of the manufacturers of the various plants and tell you the difference between the ones that John was talking about, such as these are the efficient ones, these are the inefficient ones, these are the ones that you use for manure, these are the ones that you use for sorghum, for corn? It seems so simple.

Mr. DILUZIO. Well, I would look at TAC very, very carefully as a possible source of a clearinghouse function for that information, provided you also used the existing farm agent network somewhere in the scheme.

Mr. LUJAN. Where would you put it, where would be a good place to consolidate all of that information? If I have a certain product on my farm that I want to turn into alcohol, what source could give me the information as to which is the best plant, who sells it and what engineering firm is the best firm for that—the technical information—where would be the best place to put it?

Mr. DILUZIO. In my opinion, it would have to be one of the universities or colleges in the State of New Mexico set up to do that, or to use an existing mechanism, which is the TAC group. They are accustomed to doing that.

Mr. LUJAN. So we would do it through TAC or the State of New Mexico?

Mr. DILUZIO. Set up a center somewhere.

Mr. LUJAN. So that gives us a good track to run on because we have that kind of institution in almost every State and that is where it ought to be.

Mr. DILUZIO. If any State has a technical talent to do something like that, this State certainly has it.

Mr. LUJAN. The second part of it, then, and that is the gathering of information and to find out where I can go. The other part that anyone would have trouble with, and it was alluded to by John, was the putting together of the proposal. Now, you know we have NEDA to put together proposals for SBA. Maybe that is the vehicle to help people put the proposals together. Is that the best vehicle that we have, in your experience, or is there some other vehicle that we can use?

Mr. DILUZIO. You have to do two things, Congressman. One is, you have to simplify the preparation and processing of proposals. You don't want the small farmer to process the same volumes of papers that you would require for the intermediate or large commercial plant. They are different things. You want to make it very easy for a farmer to do it.

Mr. LUJAN. We are talking about the farm level plant.

Mr. DILUZIO. There ought to be a standardized proposal form or there should be some assistance to the people that want to do that. In my opinion, again you have the choice of either a State agency doing

it for them, and this is done in several other States, or a State institute or university that is paid to do just exactly that.

Mr. LUJAN. Could you use the same thing, could you use the same place in New Mexico State to gather the information to tell me which is the best plant and to help me put in the proposal to the Department of Agriculture or to the DOE or to whomever I want a loan from?

Mr. DILUZIO. Yes. As you know, submitting proposals, it is an art. Those who know how, and in fact may have a better idea, just can't make it sell. There is a variety of plants. We talked about energy requirements. A vacuum distillation process, which while very costly, is highly efficient. It only uses about one-fifth or one-sixth of the energy that a normal distillation plant uses. It is not the kind of a plant however, that you can slap together in the backyard. There ought to be at least a standard design available which has been tested. John is right. It must be field tested so that you know exactly how it works, that is safe and can be licensed.

Mr. LUJAN. Are you talking about standardization?

Mr. DILUZIO. I am talking about standardization because with standardization you get low-cost production of facilities, you get low-maintenance costs, you get parts when you need them and everything else. The greater number or variety of plant designs you have, the more difficult it is to guarantee their safety, their reliability, or their operational life.

As you know, Congressman, the trouble with nuclear energy is that every plant is designed differently. There is no standardization. You are dead when you do that.

Mr. LUJAN. Well, do you think we have a pretty good chance of putting together, through working with a number of people, such an institution that would do those things? Do you think it is a feasible thing and that we can get on with putting together something like that?

Mr. DILUZIO. It has been done in other States. It can be done here. There is certainly no lack of talent in this State to do it.

Mr. LUJAN. Thank you.

Mr. LLOYD. I believe our time is up for this panel. I would like to take this opportunity to thank you for joining us here today.

Mr. DiLuzio, we thank you for your statement.

Mr. LLOYD. We will take a very brief recess at this time.

[There followed a short recess.]

Mr. LLOYD. At this time, we will reconvene.

Mr. Alhorn, you are on.

We have your statement and you may read it or paraphrase it.

STATEMENT OF LELAND ALHORN, EXECUTIVE DIRECTOR, NEW MEXICO SOLAR INDUSTRY DEVELOPMENT CORP.

Mr. ALHORN. Thank you, Mr. Chairman.

Congressman Roth, Congressman Lujan.

I will just paraphrase.

I am serving as the executive director of the New Mexico Solar Industry Development Corp. I would just like to take a moment to describe some of the background of this corporation and also the purpose of the corporation.

The corporation is a private, nonprofit corporation founded as a result of the recommendations from a solar industry task force appointed jointly by Senator Pete Domenici and Governor Bruce King last fall. The Senator and the Governor, as many of us do, share a common interest in helping to broaden the economic base of the private sector of New Mexico. At the same time, we are highly interested in expanding our State's role in the commercialization of solar energy.

It is true that our State has been one of the leaders in solar energy research and development and now as many of these technologies are beginning to become technically and economically feasible, we believe New Mexico should accelerate its role in solar commercialization.

We want to expand existing industry and attract new industry, to employ more of our private sector resources in this environmentally sound and clean industry of producing components for solar programs and applications. Our goal is to create from 3,000 to 5,000 new solar-related jobs in the next 3 to 5 years.

The corporation was actually formed in December 1979. This past February we celebrated a milestone in announcing that we had received support from the private sector to underwrite the expenses of our first-year program.

Our mission is two fold. First, we will promote, assist and help develop an economically viable solar energy industry in New Mexico. This will include supporting existing industry in their expansion and diversification of solar-related components and systems, designs, manufacturing installations. In addition, we will aggressively market new and emerging solar energy businesses to encourage them to locate in New Mexico and to provide employment for our growing private sector resources. Second, we will enhance the solar image of the State of New Mexico. We intend to promote the broad use of solar energy in our homes, offices, and businesses in our industrial sector. We will encourage State projects to become models for energy conservation and solar application. We plan to build customer confidence in solar applications through education, demonstration, and information dissemination.

We want everyone to be aware of the long-term beneficial effects of using alternate energy technologies today. We believe there exists a state of urgency in the commercialization of solar technology. We hope to raise the priorities given to solar applications that are economically feasible to help replace our dependence on rapidly depleting fossil energy reserves.

These technologies are readily available and literally on our doorsteps. What is still required is an effective utilization of innovative skills of the small and private-sector businesses. We need to put these technologies into common practice.

We are prepared to be the advocate for solar applications and small high-technology firms when clearly an advocate role is required. We will be developing specific programs to help small high-technology solar firms to help couple their businesses into the solar marketplace. We plan to provide a focus and an influence where clearly an influence is required to raise the level of interest in a solar project. We plan to be the catalyst and coordinator when divergent interests, lack of in-

formation or a condition of indifference is hindering a solar application or industry from achieving its full potential.

In short, we are on a fast track. We are prepared to cut redtape and give citizens of our State and of our Nation and the capable businesses an opportunity to reap the benefits of investing in solar application and products today.

In closing, I would just say that I want to compliment Frank DiLuzio on his excellent way of summarizing some of the problems with gasohol development. I can say without a doubt that most of those things that he said about the gasohol program directly apply to the solar product development business as well. I just want to reemphasize what he said in those areas.

I would be happy to answer your questions.

[The biographical sketch and prepared statement of Mr. Alhorn follow:]

BIOGRAPHICAL INFORMATION

Mr. Leland Alhorn is presently serving as Executive Director of the New Mexico Solar Industry Development Corporation. He is a loaned executive from The BDM Corporation's Technology Applications Center to serve in the NMSIDC early development. He was appointed by Governor Bruce King to serve on the Solar Industries Task Force and was an incorporator in the formation of the NMSIDC.

Mr. Alhorn has been associated with research and development organizations in Albuquerque since 1956. He worked in the Weapons Development Program at Sandia Laboratories until 1962. Since then he has been in manufacturing, marketing, and market research for Grafix, Inc., Missouri Research Laboratories, EG&G, Inc., Technology Marketing Associates, Inc., and is now Manager, Market Development at The BDM Corporation. He is a graduate of Coyne Electrical School and DeVry Institute and has done course work at the University of New Mexico.

THE ROLE OF THE FEDERAL GOVERNMENT AND SMALL, HIGH TECHNOLOGY FIRMS IN SOLAR ENERGY DEVELOPMENT

by

Mr. Leland Alhorn

Executive Director

New Mexico Solar Industry Development Corporation

This testimony was prepared for the Subcommittee on Investigations and Oversight of the Science and Technology Committee of the United States House of Representatives at a special hearing in Albuquerque, New Mexico on March 21, 1980.

INTRODUCTION

Good morning Chairman Lloyd, Congressman Lujan, Committee members, distinguished guests, ladies and gentlemen. The New Mexico Solar Industry Development Corporation very much appreciates the invitation to address you today. Our comments will address "The Role of the Federal Government and the small, high technology business in the area of Solar Energy Development."

BACKGROUND

In the way of background information, let us briefly describe the circumstances which led to the creation of this corporate body. The idea was born more than a year ago during discussions between Senator Pete Domenici and Governor Bruce King. They share a common interest in helping our state strengthen and broaden the economic base of the private sector and have a more active role in the commercialization of solar energy technologies.

Through their foresight, dedication, and nonpartisan approach, a plan evolved to assess New Mexico's needs and interests in an aggressive solar development program. A solar industries task force was appointed by the Senator and Governor, and a study was begun in August of 1979.

On November 12, 1979, a comprehensive report was written including ideas and suggestions from individuals in Government, industry, associations, and the private sector from across the state. Many practical and economically viable recommendations were included in the report. The overwhelming conclusions suggested to the Senator and Governor that a separate organization be established and charged with implementing this solar industry development program.

On December 19, 1979, a private, non-profit corporation was organized within the meaning of Section 501(c)6 of the New Mexico Non-Profit Corporation Act. Its mission is to implement an aggressive state-wide program to promote solar industry development and to encourage energy conservation and solar energy use in New Mexico. By February 8, 1980, many New Mexico businessmen had contributed financial support and had dedicated a variety of resources to assure that the initial operations could begin. This dedication and enthusiastic response from the private sector gives us the confidence that industry in New Mexico is entering a new and exciting frontier -- an era when our national dependence on foreign oil can be lessened and we can all benefit from the practical applications of alternate energy technologies.

ORGANIZATION

This cooperative venture among private enterprise, non-partisan Government leaders, and individual citizens may be unique in all of the

United States. Our success is far from being guaranteed. Our success, and, consequently, the benefits of our society are highly dependent upon the continued support and dedication of the many key advisors, directors, and individuals who have joined together to initiate this bold effort.

Figure 1 depicts the organizational relationship of the New Mexico Solar Industry Development Corporation. We want to make note of the structure and make-up of the advisory board and the board of directors. We are grateful for the support of such distinguished individuals. They represent the broadest possible range of technical, managerial, financial, and business expertise. Their willingness to devote time and energies to support our efforts is an indication of the importance with which this program is viewed throughout New Mexico. Having these individuals with their particular expertise actively involved will be key to the success of our programs. As our Corporation matures and becomes fully operational, we will add others to the advisory and director boards who have an interest and special expertise essential to fulfilling our evolving Corporate needs.

PURPOSE

The purpose of the New Mexico Solar Industry Development Corporation can be summarized as a two-fold purpose.

NEW MEXICO SOLAR INDUSTRY DEVELOPMENT CORPORATION

ORGANIZATIONAL RELATIONSHIPS

INITIAL BOARD OF DIRECTORS

ED JORY
NICK PAPPAS
LELAND ALHORN
SARA BALCOMB
ROBERT STROMBERG
JOSEPH ZANETTI
DONALD MILLER
ALBERT DIETZ
ED SMITH

INITIAL BOARD OF ADVISORS

SENATOR PETE DOMENICI
GOVERNOR BRUCE KING
ROBERT O. ANDERSON
DR. MORGAN SPARKS
DR. DONALD KERR
DAVID BAILEY
JERRY GEIST
GARY BLAKELEY
LARRY CARTER

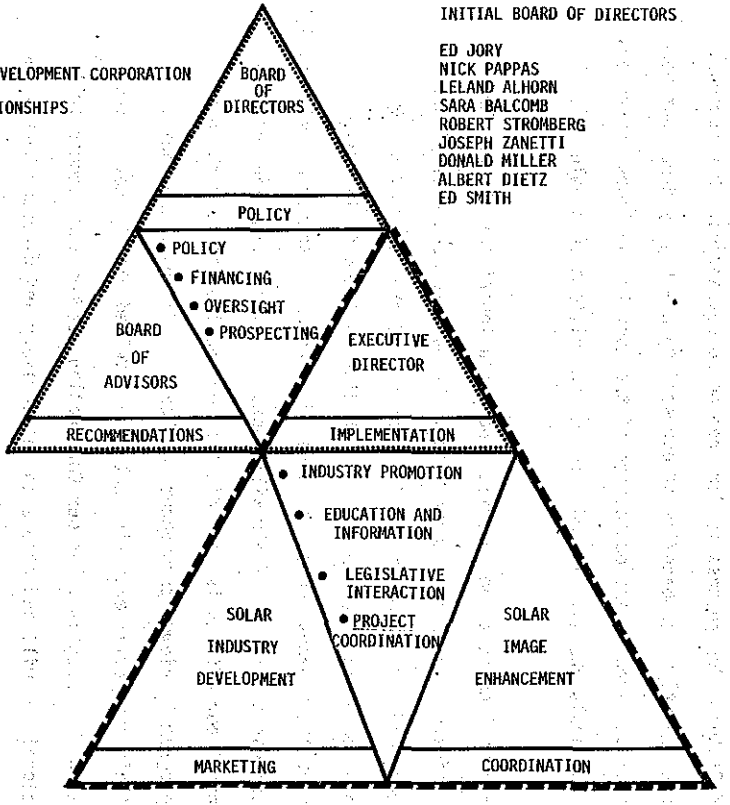

Figure 1

First, the Corporation will promote, assist, and help develop an economically viable solar industry in New Mexico. This includes supporting existing industries in their expansion and diversification in solar-related components and system design and manufacturing, installation, and servicing businesses. In addition, the Corporation will aggressively market new and emerging solar businesses to encourage them to locate in New Mexico and to provide employment for our growing private sector resources.

The second purpose is to enhance the solar image of our state. We intend to help promote the broad use of solar energy in our homes, offices, and businesses. We will encourage state projects to become models for energy conservation and solar demonstrations. We will build consumer confidence in solar applications through education and information dissemination. We want everyone to be aware of the long-term beneficial effects of using alternate energy technologies today. We plan to coordinate and cooperate closely with the other economic and industry development organizations within New Mexico. We will avoid any duplication of projects or efforts which are clearly the primary responsibility of an existing organization. We will offer our support on all common interest projects.

THE ROLE FOR FEDERAL GOVERNMENT AND SMALL, HIGH TECHNOLOGY FIRMS

The role for the Federal Government is clearly one of research, development, and demonstration of technology applications. With its massive resources and technological advantages, no private enterprise can effectively compete with big government, but its dreaded bureaucracy and its "only we know what is best for you" attitude present severe handicaps and frustrations to those involved in free enterprise. Surely, there are those in business who would like nothing better than to have the Federal Government continue to make all the decisions and dole out all of the funding. These, to be sure, represent but a small segment of our businesses. The free enterprise society, which has resulted in our country becoming the greatest developed nation in the world, is still alive and well today. It needs but to be given clear direction as to where the national energy priorities are, and are going to remain, and then be provided the incentives to achieve our goals.

The Federal Government (we the people) has a primary obligation to make available all useful research and development information regarding alternate energy technologies and demonstrations of these technologies. This information must be readily available in a clear and unambiguous form to businesses who wish to enter the solar marketplace. The Government's additional obligation also includes making all reasonable effort to aid in an effective transfer of technology from the research laboratory to the manufacturer and ultimate user.

The small, high technology firm, on the other hand, has the obligation to acquire the information, intelligently evaluate the data, and make sensible decisions regarding his entry into the solar marketplace. It is a difficult and rapidly evolving marketplace and it will require the best of management, and fiscal judgment, and marketing techniques to remain a viable and economically competitive contender in the solar business. No one, least of all the Federal Government, has an obligation to keep a poorly run, inefficient, and shoddy business in operation.

Countless man-years have been expended by the Federal Government and many other organizations to evaluate and propose improved programs to help the innovative small, high technology businesses. Many of these evaluations have been thorough and a number of good recommendations have been put forth. There remains a lot of opportunity for implementing effective programs. We want to cite two specific references which are concise and have considerable value in shaping future programs for the small and innovative businesses. The first is a report by the Small Business Administration Task Force, dated May 1979, entitled, "Small Business and Innovation." The second is a report by the Senate Hearing on Small Business and Innovation, dated August 2, 1979. These two reports contain very valuable background information, recommendations, and conclusions drawn by a host of qualified individuals. We believe these contain many of the solutions for programs to aid the small, high technology firm.

There are some projects which are already quite successful in reducing the mortality rate of small, high technology firms during their formulative years. One specific program is funded by the Economic Development Agency which allows universities to operate business development centers. One of those centers is operated by the University of New Mexico and is called the Business Assistance and Resource Center. Its efforts are aimed at new venture development, business stabilization, and expanding small businesses in the State of New Mexico. The program is aimed at giving hands-on managerial and technical assistance from highly specialized individuals to help train and give skills to the entrepreneur and the small businessman who is a combined manager, designer, marketer, and businessman.

We would also like to call attention to the very highly successful small and minority business development program which is operated by Sandia Laboratories, a quasi-governmental contractor which has been very successful in developing and nurturing small, high technology businesses. While these are but two kinds of programs, they have the capability to address, in an effective manner, the promotion of small businesses and could be used as examples and models for other government-wide programs. One thing is essential in these programs' success; that is, the attitude with which the people approach aiding the small businessman. It is very important that the people in charge of these programs recognize and are sensitive to the frustrations caused by the constant struggle that a businessman endures.

SUMMARY

In summary, we believe there exists a state of urgency in commercializing solar energy technologies. We must cause a higher priority to be given to solar applications which are able to replace our dependence on rapidly depleting fossil energy reserves. The technologies are readily available and already at our "doorstep." What is yet required is to effectively utilize the innovative skills of our private sector businesses.

These large and small, high technology firms need better information to understand the marketplace so they can develop the products and services to utilize the abundant and renewable solar energy now. They need the incentive to do it with private capital and within the free enterprise system. We cannot wait until the price of energy goes completely out of reach of the average American.

We are prepared to be the "advocate" for solar applications and the small high technology firm, when clearly an advocate role is required. We will be developing a specific program to assist small, high technology solar businesses in their quest for reliable information about the solar marketplace and the status of new innovations and technologies. We plan to aid in coupling these businesses effectively into their marketplace so that their chances for survival are improved.

We intend to provide a focus and influence, where influence is required, to raise the interest level of a solar project. We will be the catalyst and coordinator when divergent interests, lack of information, or a condition of indifference hinder a solar application or industry from achieving its full potential.

We believe our efforts will help accelerate the transfer of solar technologies from research to commercialization. In short, we are on a "fast track" prepared to cut red tape and give our citizens and capable business an opportunity to reap the benefits of investing in solar applications and products today. We plan to stimulate innovation in conservation and solar applications through close cooperation with the entrepreneur, the architect, the engineer, and especially the small, high technology firms in an attempt to penetrate the growing solar products and services fields.

Mr. LLOYD. Thank you very much. We appreciate, of course, you coming here. This is an excellent undertaking and I hope that you are indeed successful in getting that number of people involved in the process. I would hope that your location in the Sun Belt would actually generate or bring more people into that kind of an involvement.

Mr. Lujan.

Mr. LUJAN. Thank you very much. Let me really congratulate you on establishing the New Mexico Solar Industry Development Corp. I think it was a long time in coming. I think it is a good step. We have here all the potential and companies to put it altogether.

What is there, out there, now that you can see? The water heating technology, of course, is out there and being marketed and the heating and cooling of buildings. What other things do you see that need encouragement from the standpoint of government to get them out into the private sector?

Mr. ALHORN. Well, first, we believe that the wind energy programs are very close to commercialization and profitable and economically feasible. When we talk about solar, we are really including wind in programs too. So the direct use of solar for water heating and for space heating and cooling is certainly technologies which we believe can compete very effectively now with electrical means. In New Mexico they do not compete that favorably yet with the current price of gas. It is not as economical to heat your house with solar as it is to use gas. I think that our evidence shows that those rates are changing rather dramatically and rather quickly. By the time we could get a set of industries in place to be able to produce products that can be bought and purchased for an economical price, our gas prices and our electric prices are going to certainly be much higher.

Mr. LUJAN. What would it cost me today to order and put into operation a system to heat the water for my house right here in Albuquerque?

Mr. ALHORN. Well, again, I would not give a set figure, but a range of figures. With some of the lesser technologies, I believe they can do it for $500 or $600. There are certainly products on the marketplace which run in the range of $1,800 to $2,800 for effectively performing the water heating job.

Mr. LUJAN. One of the big arguments that we have going in the committee are those that push the whole concept of appropriate technologies, the little uses of solar as opposed to the big electrical generating plant. Are we stuck forever with the small uses of solar or do we look at some day the high concentration of energy from solar in one particular plant?

Mr. ALHORN. I think there is a broad range between the innovative use of solar in the home and the power tower concept for generating electricity. There is a host of areas in-between. To cite a few, certainly distributed photovoltaic power systems. We firmly believe that the DOE will reach their goals of reducing the cost of the cells. If they do, there will be a host of distributed photovoltaic systems that is high technology, but on a decentralized basis rather than centralized electric generation.

In addition there are many applications for industrial process heat. In some places, right now you can generate industrial process steam for equivalent rates to gas in that area.

Mr. LUJAN. By solar?
Mr. ALHORN. By solar.
Mr. LUJAN. Thank you.
Mr. LLOYD. Mr. Roth?
Mr. ROTH. Thank you, Mr. Chairman.
Mr. Alhorn, if you had to make a calculated guess on the number of or what percentage of our energy needs will be met by solar in, say, 20 years, what would you say?
Mr. ROTH. Well, I would like to believe that with the President stating it will be 20 percent, that there will be a national priority given to see that we try to reach that goal. I think it is certainly achievable that we could get 20 percent of some forms of our energy needs, at least our fixed heating and cooling. It is going to take some dedication and clear language from Congress and the executive branch to stand behind those goals. Our corporation has adopted a goal that we would push for 25 percent in the State of New Mexico.
Mr. ROTH. 25 percent in the State of New Mexico in 20 years?
Mr. ALHORN. Yes.
Mr. ROTH. And you are the front runners in solar energy in this State so 20 percent in 20 years would be maybe unrealistic?
Mr. ALHORN. It is unrealistic with the current incentives and the present program emphasis. We have people in the solar business crying for information of a practical nature, just as the gasohol people do. So we must accelerate some of those programs to help transfer technology. We can't wait on designing the best collector which is always just around the corner. We must get them out in the homes and businesses. Unless we do these kinds of things, certainly 20 percent is probably an impossible goal to meet.
Mr. ROTH. Thank you.
Mr. LUJAN. One more thing. Would you put on your BDM hat for a minute and tell the committee about the BDM photovoltaic system and what the plans are.
Mr. ALHORN. I am on loan to the New Mexico Solar Development Corp. as a contribution by the BDM Corp. here in Albuquerque to help foster solar development in the State. The BDM Corp. is in process of installing a 50-kilowatt photovoltaic array for the roof of a commercial office building. It is an ideal application in that the needs of the office building are greatest during the sunlight hours of a normal day. The 50 kilowatts will not provide all of the power for the building, but it will do a substantial portion. Waste heat from this array will be used to provide heat for the building. We have a building that is designed to be energy efficient. It has all the latest standard construction techniques, slightly modified, to make it more energy efficient. We have designed the building and believe that this will have a rate of energy consumption of 30,000 Btu's per square foot per year. In this regard, that compares to 1975 standards for A. & E. designs for a similar building of 175,000 Btu's per square foot per year. So we are at one-sixth of the design goal of 1975.
I might say that the demonstration project is really one of nine which is promoted by DOE throughout the United States. New Mexico is very fortunate in that we have three of those demonstration projects. There is the DBM one, there is one in the Lovington Shopping Center, and one with the El Paso Electric Co. In this State we

will be experimenting with and showing the commercialization value of photovoltaic systems over the next 3 years.

Mr. LUJAN. You have some surplus power that you can feed back into the grid; is that correct?

Mr. ALHORN. Correct. There will be 50 peak kilowatts produced and if the building does not need all of it we will be providing that excess energy to the Public Service Co. of New Mexico. They cannot purchase the power from us because regulations do not allow for purchases of electricity from a private source. We are developing information on a new area of possible legislation to take care of distributed solar systems. So their excess power can be provided to a grid rather than using expensive storage.

Mr. LLOYD. Thank you.

At this point, with unanimous consent, I would ask that the statement of Robert San Martin be entered into the record.

[The prepared statement of Mr. San Martin is as follows:]

Statement of

Robert San Martin, Deputy Assistant Secretary
for Field Operations and International Programs,
Conservation and Solar Energy

Before the House Science and Technology Subcommittee
on Investigations and Oversight

March 21, 1980

Mr. Chairman and Members of the Committee:

I welcome this opportunity to be here today to discuss the role of the federal government and small, high technology firms in solar energy development.

As you know, President Carter has declared that the Nation should commit ourselves to a goal of meeting 20 percent of our energy needs with solar and renewable resources by the end of the century. To do that, we must both develop new technology and assure that innovation takes place in the private sector. Historically, we know that small business has done a great deal of the innovation in American industry. In recent years, we have seen the phenomenon of the small, high-technology firms taking on the industrial giants and often winning to become significant industrial contributors themselves. Thus, we believe that solar energy has a stake in the health of small business. A healthy climate for small, high-technology business is a climate in which our new solar energy industries can grow rapidly enough to meet the President's goal.

In keeping with the President's policy, Secretary of Energy Charles W. Duncan, Jr. announced at a March 7, 1980 Procurement Conference that the Department of Energy would actively work to develop vigorous minority business goals and implement changes in the procurement process to facilitate small and disadvantaged business activity.

At the Conference Secretary Duncan announced the following five goals:

1) The DOE will increase its disadvantaged business performance goal up to 3 1/3 percent in FY 1980, up from approximately 1.5 percent in FY 1979. This means that approximately $250 million dollars will be let in direct prime contracts and subcontract to minority firms.

2) The DOE will establish long-range goals for minority business. In anticipation, we hope to move towards a goal of 10 percent of total direct and indirect procurement in several years time.

3) The DOE will increase its 1980 procurement for 8(a) firms from $27 million dollars in FY 1979 to $86 million in FY 1980.

4) The DOE will establish a goal of 10 percent minority participation in its grant programs.

5) The DOE will authorize and install computer terminals to access the Small Business Administration's Procurement Automated Source Systems (PASS) in all DOE's government-owned, contractor-operated (GOCOs) facilities, above $10 million dollars, as soon as present procedural problems are corrected.

A number of ongoing steps are underway in the Department of Energy to facilitate and further encourage the participation of small high technology firms. Procurements are screened for small business set-asides. To enhance the screening capability, DOE uses

a Procurement Automated Source System (PASS), which profiles capabilities of small R&D concerns. There are also goal setting measures, small business initiatives such as the assignment of small business awards to procuring activities; an unsolicited proposal reserve for R&D companies; a 10% set-aside under the Photovoltaic Energy RD&D Act (Public Law 95-590), and the Energy-Related Inventions Program.

Because of the importance of innovation in solar developments, the small business participation in our program is larger than in the Department of Energy as a whole. For the past three years approximately 19 percent of solar outlays have gone to small business. The Department of Energy accomplishment for Fiscal Year 1979 was 15 percent.

We believe more can and should be done. At our request, the Solar Energy Research Institute (SERI) at Golden, Colorado, is developing a pilot plan to expand small business participation. The following are some of the program initiatives being considered in that plan:

- Establish an advertising strategy that will provide for development and wider access to the SERI bidder's list, more opportunity for direct contact between technical staff and small businesses, and effective use of the small business network to advertise research opportunities.

- Establish policy and responsibility at SERI for coordinating storage and use of small business resource lists including

the Procurement Automated Source System (PASS). Facilitate small business entry onto appropriate lists.

- Conduct an annual analysis of the capabilities of small business in solar and solar related technologies to contribute significant R&D to the Solar Technology Program in the near term.

- Establish and conduct workshops to improve small business proposal preparation and marketing skills.

- Establish a policy and program to provide management and accounting assistance to small businesses that qualify for solar awards on technical merit.

- Institute a training program for small business engineers which meet their need for up-to-date working knowledge of DOE sponsored laboratory facilities and technical research.

- Prepare summaries of annual program opportunities for small businesses in each technical area of solar technology for early fiscal year distribution.

- Estabish a formalized and continuous monitoring and feedback process to identify new and evolving barriers to small business participation which may become institutionalized.

We hope, we will be able to utilize the outcome of the SERI pilot plan to develop similar plans at other DOE Solar oriented facilities.

Now I would like to briefly review some of the activities being pursued by Sandia Laboratories.

Sandia Laboratories

As you may well know, Sandia Laboratories assist the Department of Energy in meeting its national goal by managing technical programs, operating special-purpose solar experimental facilities, and conducting in-house scientific and engineering research. Sandia Laboratories has a very active small business and technology transfer program. The Laboratories fiscal Year 1979 R&D contracts (all in high technology solar fields--totalled $22.4 million dollars; 30% of that amount, or 6.7 million dollars was spent with small business (university contracts were a very small part of the total). For example a small business contractor in Albuquerque, New Mexico recently erected a laboratory building at Sandia's Photovoltaic Advanced Systems Test Facility. It uses "passive solar heating" by means of a "water heat storage wall" as its only source of heat.

Technology transfer of solar energy R&D last year at Sandia Laboratories encompassed a wide variety of activities in addition to direct contracting. Some of the activities were scheduled progress reports, publication of significant findings in professional and trade journals, and by person-to-person contact at meetings, conferences, workshops and symposia.

The purpose of the Sandia Laboratories technology transfer project is to augment the technical projects and speed up the

generation of a solar industry. The project has three major objectives:

- to take the initiative in identifying the organizations and persons best able to accelerate commerical development
- to supply selected technology in the forms best suited to rapid transfer of commercial capability, with emphasis on early impact technology and a continuing program to help accelerate the longer term options
- to feedback information to the program management of suggested changes in program emphasis based on needs identified in the outreach efforts

The Laboratories has also established a Resident Engineer program specifically aimed at aiding United States business--large and small--to learn first hand about current solar R&D by participating in project activities. The out-of-pocket costs to sponsoring companies is defrayed by Sandia.

Mr. Chairman, to our regret the obstacles facing small solar high technology firms are many and varied, but I can assure you we will continue to explore all viable avenues in our efforts to facilitate small, high technology business participation in the program.

This concludes my prepared testimony. I would be very pleased to answer any questions you may have.

Thank you.

Mr. LLOYD. We would like to thank Lou Hoffman for coming in on very short notice. We appreciate your presence here today and we look forward to your testimony. If you have written testimony, that will be accepted into the record. You may paraphrase it or whatever you like.

STATEMENT OF LOU HOFFMAN

Mr. HOFFMAN. Thank you, Mr. Chairman, Congressman Lujan, and Congressman Roth.

I do not have a written record, but I will send you something.

Mr. LLOYD. If you would like, we will hold the record open so that you can submit a statement.

Mr. HOFFMAN. May I do that?

Mr. LLOYD. Indeed you may.

Mr. HOFFMAN. I would also like to provide some comments today, if I could.

Mr. LLOYD. Fine. We will hold the record open so you can submit your statement at a later time.

Mr. HOFFMAN. Thank you, sir. I will.

Essentially what I have today is a set of notes to speak from which I have put together since last evening.

I am here in a sense representing the Four Corners Regional Commission. I am their Senior Policy Officer; but I can't really speak formally for them on this issue. We have had, in the last few months, a rather extensive policy research and review process evaluating a number of potential regional programs, many of which were aimed toward energy issues, as well as small technology firms. Our Governors will be considering those recommendations at the end of May and we hope that these can be formalized at that time. So in a sense I am really speaking for myself today.

The one thing that I really would like to preface my remarks with is that, in terms of the comments that we heard from the gasohol panel and the comments that we will hear from the third panel, and I am sure that you have noticed from comments in other hearings around the country, there is a great deal of commonality in problems in all these areas. It is not that gasohol has unique problems that need to be solved, it is not that geothermal has unique problems that need to be solved, it is not that solar has unique problems that need to be solved. If we are going to have successful businesses, they all have a common set of elements, a common set of problems, for which consistent solutions can be constructed, we believe.

With those comment in mind, it seems to me that maybe I can move into my remarks now. Really, what it seems to me that we are talking about is how to make businesses successful, not how to make better technologies. In that light, with respect to Dr. Sam Martin's statement, which has been submitted into the record, which I only briefly reviewed this morning, one of the points that has been made time and time again here today is that this DOE proposal, as I briefly looked at it, looks like a lot more of the same, a lot more demonstration programs. It is going to keep a lot more engineers employed, we are going to keep the technical people interested. There is a certain point at which I think you have got to shoot the engineer and go into

production. I would encourage the House of Representatives to begin thinking in those terms.

Mr. LLOYD. Excuse me for interrupting. We sometimes do think in those terms, but we have a little problem in making the jump. If we appear to say no, then we become the heavy hand, by saying to technical people, oh, the state of the art no longer counts, let's deliver the hardware. We find this is not only true in scientific areas, but it is also extremely true in national defense. As a matter of fact, we have, as you know, very brilliant men who are serving at the Secretary level who are very difficult to move off of research and development.

Mr. HOFFMAN. I would certainly agree that it is in the long-term national interest to maintain a uniform and stabilized technical base.

Mr. LLOYD. I understand what you are saying and I understand what Mr. DiLuzio was saying, but how do you maintain that? How do I hold the interest of people like Dr. Hans Mark, for instance, whom you may recognize from his work with NASA.

Mr. HOFFMAN. I would suggest that maybe Mr. DiLuzio's proposal, to cut the problem up into pieces, is really the solution to that problem. Look at those elements that you can commercialize today and go ahead with your production. Look at those elements which aren't so commercial and which need more technical development and continue to employ your research people in those areas. We are not suggesting that we try to solve all problems at once, rather we propose that incremental solutions may be preferable to no solution at all.

The second general thought that I had was related to the whole process of Government funding and subsidies. Congressman Lujan mentioned the situation with the solar industry which persisted for a couple of years, as I understand it. People sat back and didn't purchase solar systems because they were waiting for tax incentives. We have also seen some information recently that has been developed, but not released, by DOE where, for example, in their geothermal program businesses and corporations are developing programs and strategies around Government funded programs and are waiting until the Government makes a commitment to do things and make investments. Rather than to go ahead and do something, they are waiting for somebody to make it easier. I think that is a problem that the Government has to deal with, too, in terms of how to actually package the real dollars that was addressed earlier this morning. I think you can't hold a carrot out without eventually letting the donkey get to it. What we have seen that, in terms of a lot of project financing problems that could be in any of the energy development areas where there are marginal economics, for example, the White House rural energy initiatives program, $300 million targeted toward rural energy, but no specific line items within individual budgets.

You have organizations that are interested in water and sewer investments, organizations that are interested in industrial parks, you can go on down the line, but when you have to package a particular project or particular program, you have to go to each of those agencies on a project-by-project basis and try to find some funds that might eventually be packaged. That is a real problem from the perspective of the businessman.

I think, in terms of setting down a strategy for a congressional approach to solving this problem, if one would try to start with the

desired end product, a successful business that would provide a criterion around which an agenda for Government programs could be developed. I think one good way of looking at that would be to look at it from the perspective of commercial bankers. What does it take to make a commercial banker willing to invest in a business? If a commercial banker is willing to put his money on the line, generally they are pretty conservative, you can reasonably expect that that business is a pretty viable business and it is going to be successful.

I think you could summarize commercial banker's interest into five basic areas. One, he wants to make sure that there is a guaranteed supply of raw material. He wants to make sure that the management has demonstrated competence. He wants to make sure that you are dealing with proven technology and not experimental technology. He wants to make sure that there is a guaranteed source of cash flow, that you actually have a market. In terms of that cash flow, he finally wants to make sure that there is a reasonable rate of return. Without those elements, you don't have a viable business.

Depending on the maturity or the state of the business' evolution, this list really can establish, I think, a practical agenda for Government programs.

Our findings, cross-sectionally, in looking at a number of the development programs that we have investigated, have to us demonstrated that there really are four cross-cutting generic functions that the Government could characterize its programs by. These, as we see them, basically are first product and process R. & D. I think that with respect to solar we have heard that that activity is well established now, particularly in terms of space heating and direct heating applications. I think the second function is policy analysis and research, which includes advocacy. I think questions of tax policy fall into that. Tax incentives, punitive taxes on other fuels in order to make solar more competitive.

The third area is managerial advice and linkages to the business community or business resources. I think that this one element is probably the biggest single reason for the business failures that you hear of from the small business people. Management expertise. I think we are seeing that, through some of the efforts of the Solar Energy Development Corp. of New Mexico, provision of those kinds of services is being tried, they are trying to bring those kinds of resources to bear on the market.

Finally, the fourth cross-cutting element is financial package. Again, Federal funds are only available on a project-by-project basis. It makes it very difficult for an individual entrepreneur to get access to that. What I am trying to say is the public sector could make that a little easier.

Now, specifically with respect to solar business, from my earlier list, I think that the three biggest problems we have to cope with today probably would be, especially when we are dealing with small businesses, the development and enhancement of management competence, the second would be establishing cash-flow expectations, and the third would be the rate of return. Again, I characterize the last two items together. I think mechanisms are now being developed, like the New Mexico Solar Energy Development Corp., to handle the man-

agement problem. But with respect to the income issues, which are a lot tougher, I think one basically has to create a market to solve those problems.

In creating a market for solar energy, I think we are in a position much like we might have been in in the 1950's with the heat pumps. I think that experience is a very good analog that one could look at in terms of the evolution of solar heating. It is 25 years later now and heat pumps are getting 15 percent of the market on a national basis or some number like that. The growth curve was very slow, but it finally took off. We can expect the same thing in solar, I think.

Some of the key issues to developing the market certainly have been brought out today. We need to have the systems competitive on a net dollar per Btu basis. We have seen where they are. If you are heating your home today with propane, solar is very advantageous. If you are looking at water heating systems, it is very competitive. I don't think the Btu cost question is really the constraining element right now in developing a market for solar systems. I think reliability is the major issue, just as it once was with heat pumps. I think the problem basically boils down, not so much to a problem in terms of acceptability or quality of manufacture, but more to a problem associated with installation and maintenance, again not manufacturing. That was the problem with the heat pumps. They were installed by people who had no familiarity with them, knew nothing about compression systems, did not maintain them, the homeowners weren't familiar with the maintenance requirements, the systems failed, they got a black eye, nobody would buy them. I don't think we want to see that happen to solar systems.

Within those guidelines, I guess, I think I can see perhaps four potential options for further Government interest that are really an alternative to the kinds of proposals that DOE has. I think three of these areas ago directly toward solving that market development problem.

I think there is a definite need at the State and local level, possibly at the Federal level, to develop programs of training and certification for the trade. They need to understand the systems they are dealing with. They need to be competent.

I think there needs to be, and I know that the National Council of State Legislators has done some work on this, there needs to be established reasonable, reasonable in the sense of their economics for implementation, but reliable, acceptable building and equipment codes.

What I am saying is that, in terms of the ultimate user's or the customer's perception, he has to be relaxed about the risks. I think there are a couple of things that you can do to indemnify that individual from risk. One, you can have codes to help protect him on the front end.

Finally the third idea in terms of this indemnification issue, is that of warranties. Currently manufacturers' warranties are very limited. And on top of that, many times the installers will buck back the responsibility of failures to the manufacturers. I think that whole issue needs to be worked out so that if, in fact, as it seems to be in the national interest, we want solar systems installed for a number of reasons besides their economics, maybe the public sector has some busi-

ness at the front end initially in doing something to provide or at least to minimize or ameliorate the risk that a homeowner might have of system failure. If you are looking at $10,000 on a $50,000 home, that is a substantial risk to somebody, that is if you can find a $50,000 home any more.

I think, finally, the last proposal that I would like to bring up, and it is really a reiteration of Mr. DiLuzio's suggestion on the banking issue, is the idea of a revolving loan fund. I think what we are really talking about is a business development bank. It might be for solar, it might be for gasohol. I think the problem with a lot of the Federal funding programs right now is they are narrowly, functionally defined and you develop a constituency around that, you develop a set of priorities around that. That system doesn't integrate itself well under changing national priorities and local needs. I think what needs to be considered is some dynamic public function to integrate the financing capabilities of the Federal Government, perhaps on a revolving self-sustaining basis, so that various industrial components which now are only economically marginal can compete in the capital market which they might not otherwise because they are caught in that capital gap. They are between resources of family and friends. They are not yet attractive to commercial banking sources. I think the Government can do a lot there and not be in competition with private business.

[The prepared statement of Mr. Hoffman follows:]

HEARINGS MARCH 21, 1980

ALBUQUERQUE CONVENTION CENTER

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT OF THE U.S. HOUSE OF REPRESENTATIVE COMMITTEE ON SCIENCE AND TECHNOLOGY

TESTIMONY OF LOU D. HOFFMAN

SENIOR POLICY OFFICER

FOUR CORNERS REGIONAL COMMISSION

INTRODUCTION

Good morning Chairman Lloyd, members of the subcommittee. It is my pleasure to be here this morning. My comments will address "the role of the Federal Government and the small, high technology business in the development of the solar energy industry.

Before proceeding, however, I would like to preface my testimony with two comments. First, although substantial programmatic research is currently taking place on the potential role of Four Corners Regional Commission in fostering small, high technology businesses and related energy issues, I cannot necessarily speak for the Commission today. The perspectives I express today are my own. Second, I ask the subcommittee to consider my remarks in the context of all of the issues considered here today: gasohol, solar energy, and small, high technology businesses. It's instinctive to think that our individual problems are unique, but the fact is that the problems inhibiting the development of any viable commercial operation, energy related or otherwise, are shared in common. The common denominator is that of business development in a competitive marketplace. The perceived disparate needs of given industries, then, can be defined primarily as a function of business life cycle. The needs of an embryonic industry vary from those of mature firms with established product lines or services, but they are essentially the same as other firms at the same stage of business development, regardless of product commitment.

THE ROLE FOR FEDERAL GOVERNMENT AND SMALL, HIGH TECHNOLOGY FIRMS

BACKGROUND

The apparent objective of this hearing is to discuss mechanisms whereby solar energy systems may be diffused more rapidly through the accelerated development of a commercial solar energy industry. If then, emergence of sucessful solar energy firms is our objective, perhaps one good starting point for or discussion of the development of a Federal solar energy development agenda is the definition of what it takes to be a successful business. For our needs today, I propose to use a simplified definition of that criterion. Specifically, a successful firm can be identified, in large part, by its credit worthiness to a commercial banker. Five criteria must be satisfied before a commercial banker will make a loan. These are:

1. Guaranteed Source of Raw Materials
2. Demonstrated Management Competence
3. Proven, Not Experimental, Technologies
4. Guaranteed Source of Cash Flow
5. Reasonable Rate of Return

Depending on the maturity or state of business and product evolution of a firm, each of these criteria may impose or define significant challenges to a businessman or to Federal Programs intended to foster that business. Several examples might help: 1) In the emerging geothermal energy industry, resource or reservoir confimation imposes major costs and uncertainties on prospective developments; 2) Many solar space heating systems can be considered to have evolved past their experimental configurations, but their inventors lack the management savvy to bring them to the marketplace; and 3) Some well established firms, notably Chrysler Corp., are still vulnerable to cash flow failures.

GOVERNMENT TOOLS

My experience, to date, suggests that, institutionally, there are four basic, cross cutting services that the governemnt can provide to support an emerging industry, such as the solar energy industry. These are:

1. Product and Process R D&D, T&E
2. Policy Research and Advocacy
3. Management and Business Development Support
4. Financial Packaging

R D&D

With regard to the general use of solar energy systems for space and process heating and domestic water heating, it can be argued that Federal investments in applied research and demonstration programs are reaching a point of diminishing returns. Inflationary pressures on the costs of systems may be a more significant economic issue than increased efficiencies.

Policy

Government policy relative to business development generally deals with the following four areas:

1. It Regulates Prices
2. It Controls the Level of Market Concentration
3. It Controls Corporate Externalities
4. It Provides Subsidies

Escalation in the cost of conventional fuels has already made solar competitive in many applications, but it is important that the free market system participate freely in the development of alternative energy sources in order to work out and eliminate the distortions of consumer price signals which have resulted from historic energy policies.

Market concentration, in the sense of the total energy market, is perhaps the single most important shortfall of the solar industry today. Solar energy's position in the marketplace is still nil. In order for investments in solar business to be viable, sufficient business must be generated and captured by successful firms for them to enjoy competitive economies of scale and adequate income. The recommendations, which follow shortly, focus primarily upon actions which will foster a domestic market for solar energy system.

Solar applications and their manufacture are generally perceived as compatable with environmental policies. Nothing more needs to be said here about corporate externalities.

However, the final policy issue of subsidation does have a couple of facets which merit attention. Government attempts at underwriting alternative energy developments have had both positive and negative effects. On the one hand, tax incentives, demonstration grants, and business loan programs have proven benefical once implemented. On the other, the often delayed implementation of those programs and the frequent lack of specific line-item authorizations or specific reallocations of existing agency budgets for these professed priotities have only raised frustrations and inhibited private and business investments. The almost two-year throttling of the solar heating industry which resulted from the anticipation of consumer tax credits is a good example. Recent research by the DOE in geothermal programs, for example, has indicated that corporate development policies are in many cases scaled and timed to Federal subsidies and initiatives. Industries have deferred their own initiative to the public sector. I am not suggesting the termination of subsidy efforts by the Federal government. Rather I am suggesting that we must be careful not to create expectations which are not expeditiously fulfilled.

Management and Business Development

Managment and business development support is vital to the health of small business today. More firms fail for lack of comptetent management than for any other reason. Since the panel which is to follow will address this need, my comments to this subcommittee will not dwell on this issue. Also, there are already a substantial number of current Federal initiatives which address this problem, including the SBA's Small Business Development Corporations, Centers for Industrial Technology (S1250: Mr. Stevenson, et al), and the recent Presidential initiatives on behalf of small business and innovation.

Financial Packaging

The last function, financial packaging, can be key. There are those entrepreneurs in need of help, with good ideas, who have outgrown the resources of family and friends, but who are not yet successful enough to be of interest to a SBIC or venture capitalist. At the other end of the spectrum, there are also developers of alternative energy systems such as gasohol plants, who are competent businessmen, but who have discovered that conventional capital sources are unavailable. Prepackaging or the coordinated investment of public development funds at the local level has been identified as a major need for the ventures which we are discussing today. Currently each project loan or grant application must be processed in parallel, but independently, through those agencies with potential support funds; often in competition with each agency's internal, vested priorities. This hit or miss approach can be especially ineffective in a region such as ours where industrial development is so diffuse.

CONCLUSION

Today the major problems generally confronting the solar industry, which manifest themselves in the business financing difficulties discussed, are the development of:

1. Dependable Cash Flows
2. Reasonable Rates of Return

Restated, an adequate market for solar energy systems does not yet exist. Any successful program, which has as its objective the marketing of solar systems to large segments of the residential, commercial, and industrial sectors, must somehow overcome the "classical" sales obstables faced by any new product innovation. That is, whether one talks about disposable razors, electric automobiles, or solar energy devices, the following requirements must be satisfied, at a minimum:

1. Consumer confidence must be established.
2. Prices must be competitive.
3. The product must be maintainable throughout its service life at acceptable cost.
4. Sufficient information (which may include product standards and warranties) must be available to provide the basis for consumer comparison (shopping).
5. The consumer must be assured of protection from fraudulent and incompetent business tactics.

6. Consumer financing constraints must be relaxed to the extent feasible.
7. And, finally, the product must readily satisfy consumer needs. This includes initial access to the product, as well as its relative convenience of use.

Efforts to satisfy these requirements, especially those sponsored by state and federal governments, have been fragmented and incomplete. An integrated, systematic program aimed at simultaneously developing workable solutions to this entire range of requirements is necessary if solar products are to be adopted at a rate sufficient to support the accelerated development of a large scale, solar manufacturing investment in New Mexico or elsewhere. A few potential elements of such a program are suggested below:

RECOMMENDATIONS

1. Implement uniform nationwide solar product standards;
2. Develop uniform local product codes and competent inspection services;
3. Develop a nationwide educational program for building trades to assure proper installations and subsequent maintenance services;
4. Develop innovative methods of reducing the cost and related risk of solar products. For example, the current income tax credit, rebate system requires the taxpayer to front all of the cost of the solar investment for substantial periods of time. One extreme alternative would be to take a tip from Proctor and Gamble or any other consumer savvy company. For solar systems which have been previously certified as acceptable, all taxpayers would be mailed "prepayment tax credit coupons" redeemable at their local, approved, solar device dealer. This coupon would entitle the taxpayer to a specified reduction on the front end cost of the device or system. The coupon would then be used by the business to reduce its current income tax liability. Final tax record adjustments would be accomplished at income tax filing time with income tax credit claims and coupon redemption records filed to close out the Federal transaction. Each family or business unit would be entitled to redeem only one coupon, appropriate for their specific use.

Although there is substantial potential for abuse and fraud, a properly conceived system might overcome this concern.

The key aspect to this innovative approach is that the consumer is immediately placed in a financially liquid position, with respect to his solar investment. In a sense he would have "money burning a hole in his pocket." A major psychological barrier to product trial would be significantly reversed;

6. In short, Federal solar programs to date have not been effectively attuned to the needs and wants of the buying public. Innovative and pragmatic appeals to these considerations would substantially enhance the viability of the solar industry; and finally, returning to the need for financial packaging for emerging firms;

7. A cross cutting, interagency, Federal financial packaging function needs to be developed. Thereby, integrated investment strategies of sufficient scale and interdependence could be implemented in a manner to locally assure the routine emergence of firms developing alternative energy technologies and systems.

Thank you gentlemen. With that I would be happy to answer questions.

LH/kd
March 26, 1980

Mr. LLOYD. Thank you, Mr. Hoffman.

Mr. Lujan.

Mr. LUJAN. Well, Lou, I understand, from what you are saying, that the solar business is already out of its infancy, but not quite to adulthood, if we can put it that way. The things that Government can do are limited. It is a question of people having the competence and the reliability. Most of it, then, is really in the hands of the private sector. Maybe schools to train, I suppose, plumbers would be the ideal ones to go into the installation of water heating devices, the construction people for passive heating, just the certification of those types of people, but wouldn't that come—I will ask you, are there schools where a plumber can send someone to learn about the particular system to heat the water?

Mr. HOFFMAN. Well, you have asked two questions. The first is can some of these programs be sustained by the private sector, and, two, are there programs available. I have no firsthand knowledge of those programs. I know there are parallel programs by equipment manufacturers to train people in heating and air-conditioning. All the trades have their own programs within the union. I am sure that there are areas where you can get access to information about this. What I am suggesting is that I don't think that training is uniform. I don't think there are any uniform standards for that training.

In terms of the private sector supporting this, I would expect we are probably on the threshold of the private sector being able to afford to do this. I think the problem, just as in the issue raised about Texaco's participating in gasohol, is that it is easier to play a more profitable game someplace else. It is very difficult to convince management to make marginal investments in some areas that have a long-term payoff. I think the proof of the pudding is the fact that the private sector is only putting limited funds into those programs. I think, like our own technical-vocational institute here in Albuquerque, there are things that the public sector could do to bridge that gap, which may last only 6 months or it may be 5 years.

Mr. LUJAN. That kind of public sector, the educational public sector, but I am thinking in terms of we have to put in research moneys for the powerplants, solar powerplants, that sort of thing, maybe put up moneys to buy photovoltaic cells in order to increase the manufacturing capabilities so that you could bring the price down, those sorts of things. From your whole statement, other than the research moneys, and perhaps the licensing and building codes and that sort of thing, the industry is pretty well on its way. It is time for the Lee Alhorn organizations to come in and encourage these businesses.

Mr. HOFFMAN. I guess that takes me back to one of my first comments, the idea of the cost-cutting element of these problems. What we are really dealing with, in my perception, is not a problem of the state of the technology. We are dealing with the state of the technology of small businessmen. What does he need to stay in business. That is where you can help.

Mr. LUJAN. Financing primarily? Training?

Mr. HOFFMAN. Financing, training. There are a number of proposals in Congress now. There is Senate bill 1250 that Harrison Schmitt is is involved in, the idea of the innovation centers developed from the

National Science Foundation experiment and SBA's SPDC's. A number of things are being proposed in the public sector which would provide a centralized information network function. It would allow an individual entrepeneur to go efficiently to specific resources in his community when he needs the answer to a question or to find financing.

To the extent that you have an undeveloped industry that can't afford that overhead yet, there might be reasonable participation from the public sector to have a function in place that would serve multiple technical interests as our industrial base grows and evolves and technologies change. You still provide that same generic functions. They just serve a different master over time. I think that kind of service can be very useful to small businessmen.

Mr. LUJAN. Thank you.

Mr. LLOYD. Mr. Roth?

Mr. ROTH. Mr. Chairman, I am looking forward to reading Mr. Hoffman's comments that he is going to submit to the committee.

Mr. LLOYD. Mr. Babb, you now have an opportunity to expound in your area. We thank you for joining us today. Considering the shortness of time, you have done extremely well. It is all yours. You may paraphrase or submit your statement for the record, whatever you would like to do.

STATEMENT OF WILL F. BABB

Mr. BABB. Thank you, Mr. Chairman.

I have been asked to represent the independent manufacturing and marketing corporations involved with solar.

The problems concerning small businesses involved with solar technology and marketing today are, No. 1, most solar systems available today are too expensive and complicated, priced from $6,000 to $22,000. Second, presently most solar systems due to high price and complicity do not avail themself to being a mass-marketable product. Thusly the system's expense cannot be justified based on current utility rates. Third, unfortunately the middle- and lower-income families who desperately need reductions in their utility bills cannot afford the expensive systems currently being offered.

The innovations in solar technology to overcome the aforementioned problems can be gleaned from the small solar technological firms if the Government assisted these smaller independent corporations. Government research grants administered by the Department of Energy have been in the past awarded to the Nation's largest utilities and oil companies and aerospace firms and subsequently have been capturing the solar market. More than 90 percent of all Federal grants for solar research and development are being awarded to large corporations instead of the small solar businesses. A mere 30 companies have received more than 97 percent of all the solar research funds allocated by the Department of Energy's division of energy technology.

The policy by the Government stimulates a corporate take over of solar technologies, thus threatening monopolization of the solar market, increasing consumer costs, and a slowdown in solar commercialization.

Although solar energy could still be a viable substitute for nuclear power, the Atomic Energy Commission and the large utilities have

been attempting to deceive the public that solar energy is still merely a gleam in the eyes of a few absentminded scientists, while major oil companies, which already control coal, uranium, oil shale, tar sand and gas, are buying up small solar development companies in order to stymie solar energy development and eliminate any interfuel competition.

We in the solar industry agree with Energy Secretary Schlessinger that the public considers solar power an exotic novelty and must be convinced that it is a viable alternative. One of the biggest problems encountered by the solar industry is persuading the public to take a serious look at Sun power.

The problem, as we see it, is that the public is still playing a wait and see game, waiting for a price break similar to what happened with digital watches, and it is just not in the cards. The price of materials, labor, and transportation are certain to increase. Solar energy today is the cheapest it is ever going to be.

What is needed is an all-out commitment by Government through a solar agency separate from the Department of Energy to promote solar alternatives and advise industry and consumers as to governmental solar programs, tax incentives, low-cost solar loans, Sun rights legislation, educational materials, and establish consumer protection through performance standards.

The present administration has committed the Nation to supplying 20 percent of its needs from solar energy by the year 2000. In 1981 authorization for solar programs makes up only 13 percent of the Department of Energy's budget. After adjusting for inflation, this gives a 3-percent reduction in funding for solar over last year.

The concerns most immediate to Sun Systems, Inc., Solar Age Manufacturing and other small technically oriented small manufacturers should be, No. 1, how to get technical data already available. We need a centralized pool and clearinghouse of all available technical data to date.

No. 2, small manufacturers need availability of governmental funding through a governmental agency similar to SBA making funds readily available to manufacturers not in the form of grants, which take months to get. Small manufacturers cannot afford the time nor the burdensome paperwork involved in acquiring grants. Some form of funding should be made available by prior qualification or Government should search out viable manufacturers in need of funding.

No. 3, manufacturers should have available from EPA studies done on materials used in various solar systems, materials to use or nor to use.

No. 4, Bureau of Standards needs to standardize a rating for solar output, such as Btu's. We need a rating system such as gas furnaces regarding output such as class I hot air hybrid collector rated at 3,000 Btu's per hour. That would be No. 5.

No. 6, formation of an agency to promote solar strictly. Presently DOE is the solar agency, which implies a conflict of interest due to the agency's interest in petroleum industry and nuclear industry.

No. 7, funding should be available to the buying public for effective low-cost solar appliances. These should be direct loans as opposed to guaranteed loans. Tax credits should be increased and not made a one-

time credit. This should be in the form of a rebate as opposed to attached to taxes.

No. 8, greater tax incentives to small businesses involved in solar application, both manufacturing and marketing.

No. 9, much more education of the public to the benefits of supplement solar heating, stress dollars saved as opposed to energy conservation.

We feel the Government should and could become more involved in solar industries by simply getting more input from both manufacturing and marketing. This would streamline information and hopefully end much of the confusion and doubt associated with solar today.

Thank you.

Mr. LLOYD. Mr. Lujan?

Mr. LUJAN. I thought that that was what we were doing with SERI, one central place to collect all the solar data. Isn't that how it is working out?

Mr. BABB. No. The technical data is not available, they are not familiar with all the information that is available. There is a lot of doubt on their part as to what is available.

Mr. LUJAN. Do you think it could be the proper repository for that type of information?

Mr. BABB. Do I think it is now or could be? It could be; yes, sir.

Mr. LUJAN. In theory it should be?

Mr. BABB. In theory.

Mr. LUJAN. The second point that you make of some funding agency like SBA, why not SBA? Is it difficult to go to SBA?

Mr. BABB. Yes, it is. It is difficult to get. With solar technology, people shy away from it. The Government with SBA handling that is afraid to make the decision yes or no. Today he may keep his job; tomorrow if he makes the wrong decision he may be out. We need—what we are talking about is an agency strictly to fund solar. If a fellow does go ahead and give the OK on a loan or financing, his job is not in jeopardy. There is a lot of doubt as to whether solar still works in the Government today.

Mr. LUJAN. What is wrong with building up the capability within SBA to train somebody solar directed?

Mr. BABB. I think it could be done.

Mr. LUJAN. You are talking about putting in an agency just for solar. The DOE has a lot of conflicts and they have to promote all the other forms of energy. One of the things that has puzzled me all along is that the solar industry itself, or maybe the solar energy research community, I don't know, probably because of the acceptability of solar have diluted the word solar to include, maybe not diluted, maybe expanded, but in terms of what you are talking about with concentration on solar, it is diluting to include biomass, to include wind. So on one hand you are saying get one Government agency just for solar, but, on the other hand, because solar is so acceptable, let's ride that acceptable wagon and include these other areas in there.

Mr. BABB. There is a problem. What we are talking about is that we want to educate the public. After all, what are we doing with solar energy? We are trying to get people to go to alternative sources for heating or fuels. This agency—what we need to do is to educate the

public. The way the public looks at solar now—the Government is in doubt as to whether solar is really that effective. They talk about solar in saving natural resources, energy conservation. The man that is worried about making his mortgage payment, the high interest rates, he is on a fixed income, he could really care less about energy conservation. He is worried about whether he will be able to meet that heating bill next month. This agency should be stressing more the dollars saved by going to an alternative heating system, whether it be biomass or whatever. This is where we think this committee or agency should come into play.

Mr. LUJAN. By the way, what is that [indicating]?

Mr. BABB. That is one of our products. That is an area space-heating system. It is a window unit. It has no storage capacity. This is really to illustrate the simplicity of solar. This is an aluminum box, an aluminum absorber plate, which is louvered. You take air in from the back side of the house.

Mr. LLOYD. Can you operate it?

Mr. BABB. It has to have sunlight on it. There is a sensor switch in it.

Mr. LLOYD. I see.

Mr. BABB. If there is sunlight and there is 90 degrees picked up by the absorber plate, there is a master switch in the front of the panel which allows the blower to be activated if there is a demand for heat. This has its own thermostat. If there is a demand for heat, it takes air from the house, pulls it through, strips the heat off the absorber plate, which is all aluminum, factory baked-on acrylic, strips the heat off and returns the solar heated air back into the house. With this unit, we have been able to pick up at the register alone 140 degrees on a mild day. This is pulling in 40-degree air from the outside. This is testing it outside. This is used for space heating.

Mr. LLOYD. Would I make that an integral function of my roof?

Mr. BABB. No. This fits into a window or a south-facing wall.

Mr. LLOYD. I see. But it is an outside surface, but you have to build load-bearing surfaces around it; is that correct? You can't transmit any load through that, can you?

Mr. BABB. What load are you talking about?

Mr. LLOYD. You have a structure and the structure has a load to it, that is to say, you have support columns, et cetera, to support the roof and the rest of the structure to make it an integral unit. This, then, becomes an additional weight for that unit to bear; is that correct?

Mr. BABB. This weighs approximately 40 pounds.

Mr. LLOYD. I realize that, but you weaken the whole structure when you put in a subsystem that is not load bearing. This is not load bearing?

Mr. BABB. No; it isn't.

Mr. LUJAN. Can you take out a window to put it in?

Mr. BABB. It is just like a window air-conditioning unit. You raise the window, seal around the window. The size of the box is the size of a cinder block on the register side. You can remove a cinder block and it can be placed in without cutting the integrity of the weight-bearing wall. It will fit between two studs so you are not cutting into the weight-bearing integrity of the wall. These are used primarily where people are at home during the day, particularly retired people

who like the thermostat up high. They like that heat up during the day.

Commercial applications, around town we have them in service stations. There is no storage capacity capability to the unit, but that is when the people are there, this is during the day when they are working.

Mr. LLOYD. How much heat does this gather on a day like today?

Mr. BABB. This was tested by the New Mexico State University at Las Cruces where it delivered 4,400 Btu's per hour.

Mr. LUJAN. Can you hang it outside a solid wall and stick that [indicating] through the wall?

Mr. BABB. Yes, sir.

Mr. LUJAN. So even if you didn't have a window you could use it as long as you could receive the sunlight?

Mr. BABB. Yes.

Mr. LLOYD. How much does that cost?

Mr. BABB. That retails for $750.

Mr. LLOYD. How long would it take to repay this $750?

Mr. BABB. After your tax credits, it will pay for itself within 3 years.

Mr. LLOYD. Mr. Roth?

Mr. ROTH. Is there a lot of upkeep on something like this?

Mr. LLOYD. The only moving part you have is the blower, the fan motor itself, and that is warranted by the manufacturer. It is in warranty for 1 year, the thermostat for 1 year, and the sensing unit for 1 year. The box itself and the rest of this is all aluminum and Fiberglas and it is warranted for 5 years.

Mr. ROTH. You need electricity to run that, though, don't you?

Mr. BABB. Yes, 110.

Mr. LLOYD. What kind of maintenance do you have to have on that? Do I have to wash it off periodically?

Mr. BABB. That would be the only thing you would have to do with it. If it collected dust, you would just wash it off with a hose.

Mr. LLOYD. I mean is there any relationship to the efficiency as to the cleanliness of it?

Mr. BABB. Right. You are cutting down on the transparency of the Fiberglas.

Mr. LLOYD. All right. Thank you very much.

Mr. LUJAN. Are you doing pretty good with that?

Mr. BABB. Yes, sir, very well.

Mr. LLOYD. Thank you.

I think it is time for a seventh-inning stretch and then we will have the next panel.

This is the final stretch, so we will move right along.

I would like to take this opportunity to welcome you to this hearing and thank you very much for participating.

We will get underway very quickly by asking Mr. Brandvold to lead off. If you have a statement, we will accept it for the record without objection.

STATEMENT OF GLEN E. BRANDVOLD

Mr. BRANDVOLD. Thank you, Mr. Chairman. It is a pleasure to be here.

I do have a statement which has been prepared, but I think I will try to just give some of the highlights of that statement.

Sandia Labs is well known around Albuquerque, having been a member of the community here for 30 years. Even some of the local people may not realize that almost one-third of the work at Sandia Labs is in the energy technology areas. Most of it emphasizes high technology.

We feel very keenly the need to get the information that is being generated both in the laboratory and by the many contractors we seek out into the hands of somebody who can do something with it in the marketplace. Technology existing only in the hands of our engineers or in the contract reports is not of any value to someone putting it into practical use.

We think that perhaps one of the most effective ways we have of technology transfer in the high-technology area is by seeking ways to involve high-technology firms of all sorts in the mainstream of our development activities.

There is a table in my prepared statement which has some breakdown of the participation by small and disadvantaged businesses in our programs. It is very substantial in every area.

We particularly seek out small businesses in the high-technology area because we find that in innovation per dollar spent we very frequently get the greatest return by small businesses; perhaps by sheer strength of numbers they have more good ideas. It takes a little extra work to get to the high-technology smaller firms and it has got to start basically with the engineers and the program people that are writing up the breakdown of technical tasks that are to be studied. By breaking tasks down to specialty areas that enables the small business firms to compete very well with some of the large firms.

We try to do some things to remove the bias that large companies have because they have got a lot of tech writers and slick photographers and can write better proposals. So we do such things as putting page limits on responses to proposals so you don't get sandbagged by the big company's boiler plate.

The amount of that contracting that we can do, however, and we do a great deal of it, still winds up being somewhat limited. There are a lot more companies out there than those we have funds to directly contract with.

To reach some of those other firms and basically try to get them either up to speed in the technology area or get them aware that there will be an opportunity next year, we do some extraordinary advertising. We advertise in not just the classic Government procurement places like the Commerce Business Daily, but we advertise in trade journals and we have advertised in the Wall Street Journal at times to seek the firms which perhaps are not accustomed to necessarily Government research funding.

We sponsor fulltime residency for engineers from industry in the laboratory. Again, the idea being that a good way to get someone up to speed in a new technology area is to connect them up one-on-one with someone who is working in the field for an extended period, typically 3 to 6 months, so that they can hands-on learn about the technology, whether it is solar, whether it is geothermal well logging technology, whatever the particular field is.

In my prepared statement, I chose to highlight one example of an experience we have had in the wind turbine area. As Lee Alhorn mentioned, we, too, believe that wind machines in many, many parts of the United States are very close to being practical, to being economical, to being an attractive alternative for a wide-range of users.

We started about 7 years ago with an unconventional wind turbine design that was patented by a Frenchman about 50 years ago, but there isn't any evidence he ever made the machine. A few years into this program, it turned out to be very technically successful. So about 3 years ago we went to some industries and basically had a couple of very detailed design and manufacturing and marketing cost studies done. The two studies were done by two contractors mainly simulating two business methods for getting such products into the marketplace. One I would characterize as a large business approach where one would essentially vertically integrate the entire design, manufacturing, and marketing process into a single company.

The second was a small business approach where the businessman would essentially subcontract for much of the design, and much or all of the pieces comprising the machinery to various firms, and would really serve as a warehousing and marketing outlet.

Interestingly enough these two studies, done independently, resulted in very competitive answers. In truth the small business firm, because of their overhead structures and a whole bunch of other things, turned out to have some small advantages over a large business approach. The consequence of that has been that several companies, at least partly as a result of doing that cost study themselves, are in the commercialization of that machine.

I think, as commented earlier, the commercialization of the technology is probably the toughest part of the job. I think it is going to be more difficult for us to do than the technology development. In this case, both the large business and the two small businesses, really using a business scenario very similar to that seen in the study, are in the beginning of operations and are selling machines around the country.

How to extend that to other areas is going to be a challenge that certainly the Department of Energy has, field contractors such as we are, for the Department of Energy has. The varied approaches that we have taken have had some limited success and we are working very hard to extend those successes further.

I would be glad to answer your questions.

[The prepared statement of Mr. Brandvold follows:]

Technology Transfer in High-Technology Energy R&D

G. E. Brandvold
Sandia National Laboratories

Sandia National Laboratories is one of the Department of Energy's multi-program institutions engaged in a broad spectrum of research and engineering development activities. Projects in energy resource development or utilization comprise nearly 1/3 of the current work of the Laboratories. These projects encompass virtually every energy sector - nuclear technology both for fission reactors and potential future fusion plants, fossil fuel R&D for coal utilization and enhanced oil and gas recovery, well drilling and completion technology for geothermal resource development, high-technology solar energy technology development for electric generation or high-temperature thermal processes, and investigations aimed toward improved efficiency in using fuels in our engines and power plants. Supplementing these project activities are basic energy science studies which we expect will yield insights leading to further opportunities to contribute to remedies for our nation's energy problems.

An integral, and essential, part of all of these activities is the participation of the complete range of innovative resources in the country - universities, research centers, and small and large business firms. This participation is essential

so that the technology advances achieved under government sponsorship can be put in the hands of industry for practical application. We find that in many instances smaller business firms have the best capability both for finding innovative ways of doing things and for implementing those ways in the market place.

A summary of last year's business participation in our Laboratories programs is shown in Table 1. In every program area the contributions by small business and disadvantaged business is substantial. We believe this practice of direct, funded participation in the mainstream R&D program activities is the most effective means of technology transfer we have. Let me emphasize we are not heeding some altruistic motive in this regard - we just find it good business; the participants we use are the best qualified for the job.

Because there are a whole lot more businesses than we can directly contract with, we also try to pass on new technology to them in other ways. Table 2 lists some of the technology transfer efforts in the past year in just one energy area - solar energy. We make special efforts to identify potential business participants among our technical visitors, and put them in direct communication with an engineer or scientist within the Laboratories in the appropriate technology area. This "one-on-one" approach we hope opens an access door to the program activities which may lead to future participation of the business in our activities.

We hold workshops specifically for encouraging industry participation, as the example Exhibit 1 "Vertical Axis Wind Turbine Design Technology Seminar for Industry" announcement describes. Our mailing list was over 500. In addition the seminar was advertised in industry magazines.

A further effort to aid technology transfer is the Resident Engineer program, by which an industry engineer can work in selected project areas for an extended period to learn "hands-on" what current technology status is. Exhibit 2 is a copy of an advertisement which we periodically place in appropriate trade magazines and journals to find candidates. We are authorized by the DOE to assist participants (if desired) by defraying company out-of-pocket costs for participants.

Finally, we would like to high-light a specific example of "pay-off" in business participation in high-technology energy development. The example is one of our smaller development programs - the vertical axis (or Darrieus) wind turbine. This "eggbeater" machine (Figure 1) was virtually a laboratory curiosity seven years ago. Initial scientific feasibility tests were so encouraging that about 3 years ago we went to two business firms - A. T. Kearney and Alcoa - to perform a detailed design and manufacturing study for commercialization of the machines. The two studies were directed at two business scenarios (Figure 2); the first envisaged a small business firm

which would mainly subcontract parts to other firms and act as marketing organization. The second was a more vertically-integrated business typical of larger firms. Fig. 3 shows the cost of energy which those studies showed could be achieved by machines built and sold under the scenarios. The solid circles and triangles were for the original design, while the open ones are for a possible improved "second generation" design. Note that the small business scenario was very competitive with the large company scenario, and both have the potential of delivering electric power at an attractive rate.

There are now 4 companies selling commercial VAWT's (Table 3). Alcoa is "trial marketing" the range of machines shown in Figure 4, but two small firms - Dynergy and Tumac - are marketing small machines in much the same way the small business scenario envisaged.

We are striving to continue and expand this kind of industry initiative. These machines appear simple in concept - and that simplicity is what enables potential low-cost fabrication. But there is some very sophisticated engineering design behind them. A list of computer codes developed and used to design VAWT's is shown in Table 4: We document and make available these tools as quickly as feasible to enable prospective manufacturers to utilize them. Most high-technology firms now have access to computers to use these design tools.

Our program continues to solicit help from industry for further design improvements. Major "purchased engineering" is listed in Table 5; we expect to expand this list as program activities proceed.

We would be happy to provide further information in this area if it would be of interest.

TABLE 1

SB/DB PARTICIPATION IN MAJOR PROGRAMS
FY79

Program Name	Small Business		Disadvantaged* Business		Large Business	
	$	%	$	%	$	%
R&D Activity for Weapons	11,844,466.32	52	2,408,314.06	11	8,640,092.60	37
Full-Scale Test	1,455,627.53	54	245,768.74	9	991,261.75	37
Production & Surveillance	1,622,863.99	34	166,747.18	4	2,891,042.25	62
Verification & Control Tech'gy.	983,171.30	27	230,081.97	7	2,398,832.42	66
Nuclear Materials Security & Safeguards	1,886,549.80	47	206,253.57	5	1,929,630.87	48
Internal Confinement Fusion	1,876,855.10	70	343,351.49	13	446,518.52	17
Waste Management Defense	2,618,625.27	76	109,155.83	3	736,665.48	21
Fossil Energy (Coal, Petroleum, & Gas)	2,321,964.83	50	201,371.05	5	2,095,214.75	45
Solar Energy	5,695,002.72	35	671,151.89	4	10,035,658.49	61
Geothermal Energy	1,892,805.72	83	38,564.99	2	343,569.06	15
Magnetic Fusion Energy	104,171.55	44	29,049.41	12	103,439.15	44
Fission Energy, Waste Mgmt.	353,974.12	47	3,759.03	1	383,763.70	52
Fission Energy	740,914.16	37	18,641.00	1	1,249,081.55	62
Basic Energy Sciences	644,740.22	75	43,322.00	5	171,728.90	20
Conservation	-	-	-	-	-	-
Environment	522,308.49	83	12,133.00	2	95,888.20	15
Basic Sciences	18,131.39	83	-	-	3,730.00	17
Emergency Preparedness (Strategic Petroleum Reserves)	2,127.62	64	326.70	10	880.00	26

*Not included in Small Business figures.

TABLE 2

SOLAR ENERGY PROGRAMS TECHNOLOGY TRANSFER ACTIVITIES - 1979

- **VISITORS**
  - 4814 Non-Technical
  - 3073 Technical
    - U.S. (2587)
    - Foreign (451)
    - No. of Countries (35)
- **TECHNICAL PUBLICATIONS**
  - 88
- **WORKSHOPS/CONFERENCES**
  - 8
- **RESIDENT ENGINEER PROGRAM**
- **PUBLIC RELATIONS**
  - 29 TV Network Coverage (Domestic & Foreign)
  - 18 Domestic TV Stations
  - 76 Magazine Articles (Domestic & Foreign)
  - 36 Newswriter Visits (3 News Services; 33 Newspapers)
  - 11 Book/Film Publishers
  - 22 Film Makers
  - 7 News Releases (Distributed to 832 News Media)

RPS:4714:1/15/80

EXHIBIT 2

Extracted from "Solar Age" - July 1978; also published in "Geothermal Energy" June 1978 and "Solar Engineering" June 1978. GEB:4710:3/22/79

RICHARD LIVINGSTONE

Business Beat

The announced acquisition of a minority interest in Northrup, Inc. by Atlantic Richfield Co. reflects the continued interest in solar energy among major oil companies and perhaps also ARCO's interest in bidding for a major share of solar electric markets. ARCO's move to pick up a stake in the Hutchins, Tex. HVAC firm, the leading maker of Fresnel lens concentrators, preceded its acquisition last fall of Solar Technology International Inc., a Chatsworth, Calif., producer of photovoltaic cells now renamed The ARCO Solar Division. Northrup is working closely with ARCO Solar to develop a photovoltaic concentrator ratio of 16 to 1, up from a 10 to 1 level. The Texas firm also hired Floyd Blake, former solar systems manager for Martin Marietta and an expert in large solar electric systems.

Gould, Inc., Rolling Meadows, Ill., has set its sights on a share of the market for solar controls. The company, whose $1.6 billion annual volume comes primarily from sales of automotive and industrial batteries, instruments and control devices, has acquired Sunkeeper Controls, Inc., Andover, Mass. It has since renamed the company Andover Controls, Inc. The Bay State company supplied the computer controls for the solar system now operating at the Terraset Elementary School in Reston, Va. It also has contracts for other solar systems, including one planned for St. Luke's Hospital in Middleboro, Mass., for which it will supply an $11,000 sixty-four-circuit control capacity module, with eight of the circuits used to operate the solar system. In addition to Sunkeeper, Gould has acquired Modicon Corporation, a controller manufacturer with $11 million in annual sales, also based in Andover, Mass. So far this year, Gould has acquired two other instrument/control companies: Bio-Mation Corporation and Hoffman Electronics, Inc., both of El Monte, Calif., the former a producer of avionic systems and audio-visual equipment, the latter a pioneer in the manufacture of solar cells.

Richard Livingstone writes on business and financial aspects of solar energy.

Jersey Patents, Inc., Paterson, N.J., has announced start of construction for the world's first house to get all of its energy from the sun. The prototype house will obtain all of its domestic water, space heat, cooling, and electricity from a solar system. Michael and John Sandoval, Lakeside, Calif. builders, to whom Jersey Patents has licensed its solar technology, will build the house. Jersey Patents' president, Jack Hedger, developed the Rankine-cycle reciprocating engine to be used in the system; Hedger exhibited a 100-watt solar electric system at the world's first symposium for applied solar energy held in Phoenix, Ariz., in 1955.

Springborn Laboratories, Inc., Enfield, Conn., has completed a study of world markets for solar equipment, with special emphasis on solar markets for plastics. The study was based in large part on scores of interviews with solar research and marketing personnel in industry and government throughout the United States, in major European countries, and in Japan. In addition to appraising the prospects for heat transfer fluids on selective surface coatings, it analyzes costs, economics, and market prospects for solar water heaters, solar swimming pool systems, flat plate collectors, concentrators, and other solar equipment. It also gives details on a dozen low-cost, all-plastic solar systems, including several planned for marketing this year, and forecasts a growing market for certain types of plastics in glazings, frames,

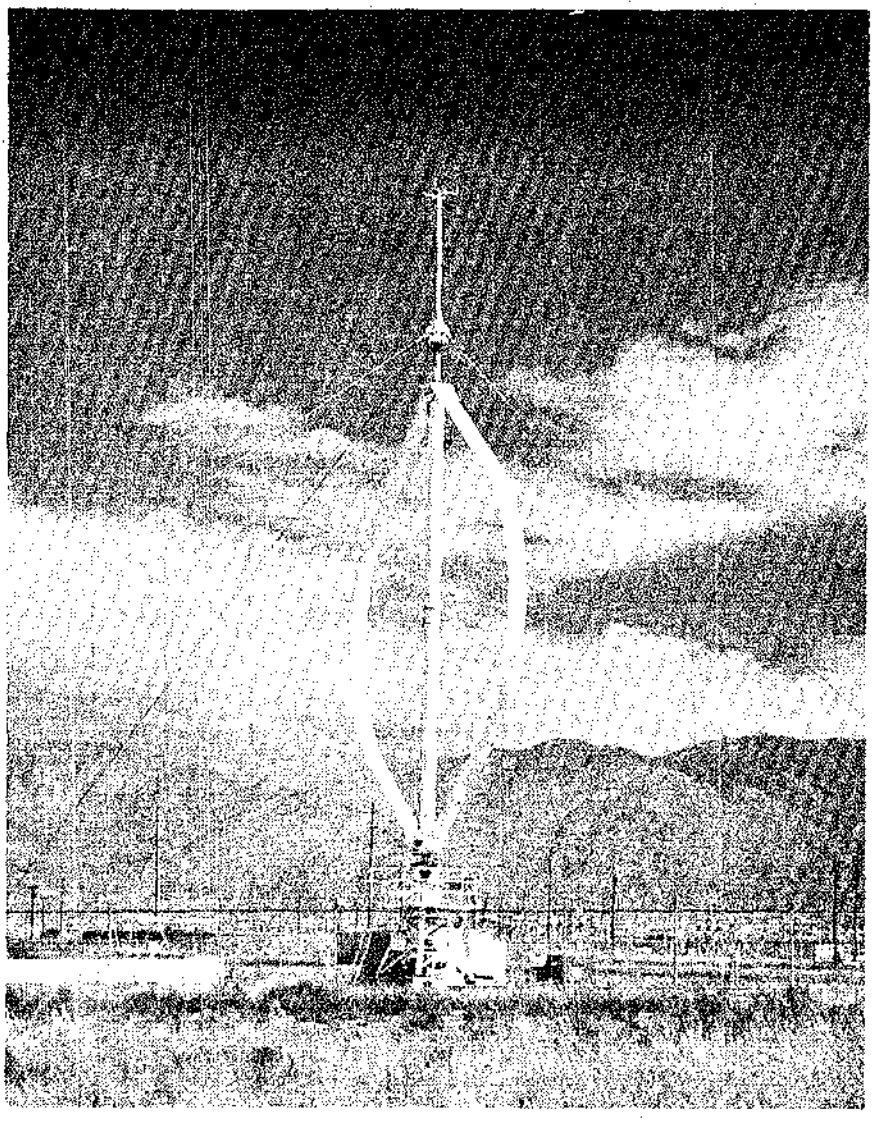

Figure 1